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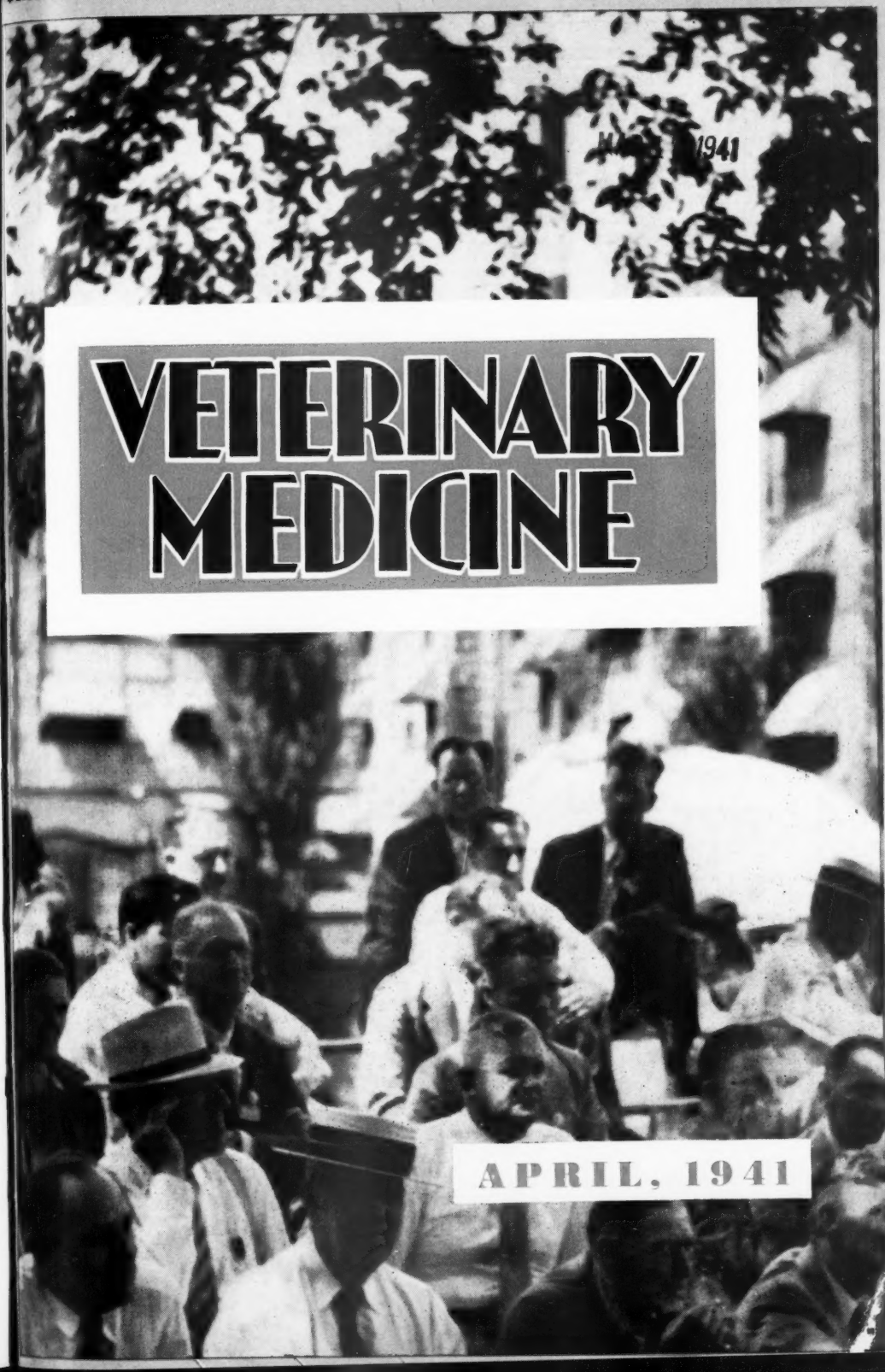

VETERINARY MEDICINE

APRIL, 1941

Synthetic Thiamin Chloride (Vitamin B_1)

Thiamin Chloride (Vitamin B_1) is more often deficient in the diet of dogs than any other vitamin. It is not stored in the tissues to any considerable extent and therefore the supply needs to be fairly constant. For these reasons, many dogs are continually on the margin of a deficiency of this and other vitamins of the B group, and suffer from such deficiencies in greater or less degree from any interruption of the supply, such as inappetence or fasting, or from any increase in the B_1 requirement, such as strenuous exercise, fever, increased carbohydrate intake or any condition that increases the metabolism. Oral administration of the vitamin constitutes adequate treatment when the digestive system is still functioning. For more acute conditions such as extreme nervousness or fright disease due to thiamin deficiency or to a combined deficiency of thiamin, nicotinic acid and riboflavin, the treatment should be given hypodermically. In fact, it is best to start the treatment of all acute cases in this way. Mild attacks of vitamin B_1 deficiency in the dog are characterized by timidity, nervousness, barking, irritability, moroseness, and stupidity. The appetite is usually depressed and as the deficiency becomes graver anorexia may be complete. The refined chemicals, thiamin chloride, nicotinic acid and riboflavin, are intended for therapeutic use in more or less acute cases. The yeast preparations as supplements to the ration are intended for the prevention of these deficiencies, and for treatment of the milder forms, not only in pets but in all farm animals, including poultry.

THIAMIN CHLORIDE (SYNTHETIC)

Vitamin B_1

Uses: For relief of B_1 avitaminoses.

Directions: The normal daily requirement of thiamin for a dog is approximately 250 USP units. This requirement is increased by rapid growth, pregnancy, lactation, debilitating disease, hard work, etc. The therapeutic dose is twice the normal requirement once daily; in very acute cases, for example in fright disease, give 500 USP units twice the first day and once daily thereafter until the animal is eating well.

Solutions for Hypodermic Use

(1cc contains 6,666 USP units of vitamin B_1.)

One 10cc vial (66,666 units B_1)	$ 3.00
Six 10cc vials 400,000 units B_1)	17.20

(Each cc contains 333 USP units of vitamin B_1.)

One 10cc vial (3,330 units B_1)	$0.65
Six 10cc vials (20,000 units B_1)	3.25
One 50cc vial (16,650 units B_1)	2.50

Tablets for Oral Administration

(1 mgm contains 333 USP units vitamin B_1.)

100 1/3-mgm tablets (11,100 units B_1)	$0.88
500 1/3-mgm tablets (55,500 units B_1)	3.25
100 1-mgm tablets (33,300 units B_1)	1.40
500 1mgm tablets (166,500 units B_1)	6.20

ELIXIR THIAMIN CHLORIDE

For Oral Administration

Uses: In pregnancy, lactation, anemia, certain gastrointestinal disorders, including diarrhea and constipation.

Directions: The same as for the use of thiamin chloride, when the intestinal tract is not gravely involved. It should be administered only when absorption from the digestive tract is possible.

Dose: One or more teaspoonsful as indicated.

(Each ounce contains 2,400 USP units thiamin chloride, 8.5 gm sucrose, and 10% alcohol.)

8-ounce bottle (19,200 units B_1)	$ 1.00
1-pint bottle (38,400 units B_1)	1.60
1-quart bottle (76,800 units B_1)	3.00
1-gallon bottle (307,200 units B_1)	11.50

NICOTINIC ACID

Tablets for Oral Administration

Use: For Prevention and treatment of canine blacktongue.

Directions: Two tablets per day for each 20 lbs. of body weight, or as otherwise indicated.

(Each tablet contains 30 mgm nicotinic acid.)

100 tablets (3,000 mgm nicotinic acid)	$0.75
500 tablets (15,000 mgm nicotinic acid)	3.00
1000 tablets (30,000 mgm nicotinic acid)	5.00

RIBOFLAVIN

Tablets for Oral Administration

Uses: Avitaminosis B_2.

(Each tablet contains 1 mgm riboflavin—400 S-B units vitamin B_2. Tablet bisected.)

100 tablets (100 mgm riboflavin)	$1.25
500 tablets (500 mgm riboflavin)	5.00
1000 tablets (1000 mgm riboflavin)	8.50

VITAMIN B-COMPLEX

Tablets for Oral Administration

Uses: Inappetence, dermatoses due to B-complex deficiency, canine blacktongue.

Directions: Two tablets per day for each 10 lbs. of body weight, or as indicated.

(Each 7.5-grain tablet contains 25 USP units B_1, 18 gamma riboflavin (B_2, G), 20 mgm nicotinic acid, plus all the other factors of vitamin B as found in brewer's yeast.)

500 7.5-grain tablets	$ 2.00
1000 7.5-grain tablets	3.75
5000 7.5-grain tablets	16.50

Remarks: These tablets are made of the finest brewer's yeast and fortified with 20 milligrams of nicotinic acid.

VITAMIN B_1 AND B_2 (G)

Tablets for Oral Administration

Uses: Inappetence, avitaminosis B.

Directions: 5 to 10 tablets per day.

(Each 7.5-grain tablet contains 25 USP units vitamin B_1, 18 gamma riboflavin (B_2, G), and all factors of the B complex in brewer's yeast.)

500 7.5-grain tablets	$1.00
1000 7.5-grain tablets	1.75
5000 7.5-grain tablets	1.25 per M
10000 7-5-grain tablets	.85 per M

Remarks: These tablets are soft pressed. They break up easily. As a rule 70% of dogs will eat them from the hand. Note high content of B_1 in these tablets. They are suitable for dispensing.

BREWERS YEAST POWDER

Uses: As an addition to the ration to maintain proper vitamin B balance.

Directions: 3% to 5% of the ration.

(Each gram contains: 50-55 USP units vitamin B_1, 40-50 micrograms vitamin B_2 (G) riboflavin, 0.56 mgm nicotinic acid, plus the other factors of B complex found in brewer's yeast.)

1-lb. can	$ 0.50
5-lb. can	2.10
25-lb. drum	6.75
100-lb. drum	24.00

Remarks: Do not buy brewer's yeast on price alone; insist on a statement of vitamin content on the label. Our yeast is specially prepared for medication and contains five to seven times as much vitamin B as some brands on the market.

MERILLAT-LAINE COMPANY, Inc.

1827 WABASH AVE. CHICAGO

ALL THREE

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PARKE, DAVIS & COMPANY

Sulfapyridine

Supplied as 0.5 Gm. Compressed Tablets, No. 785, in bottles of 50, 100, and 1000; and as 0.25 Gm. Capsules, No. 466, in bottles of 50, 100, and 500.

Sulfanilamide

Supplied as 0.325 Gm. Compressed Tablets, No. 760, in bottles of 25, 100, and 500; and as 0.5 Gm. Compressed Tablets No. 762, in bottles of 100 and 500.

Sulfathiazole

Supplied as 0.25 Gm. Compressed Tablets, No. 797, in bottles of 100, 500, and 1000; and as 0.5 Gm. Compressed Tablets, No. 796, in bottles of 100, 500, and 1000.

PARKE, DAVIS & COMPANY

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXVI APRIL, 1941 No. 4

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THE FRONT COVER

This is a view of a section of the audience at the clinic of the Missouri V. M. A. July 2, 1940. The clinic was held at Excelsior Springs, on the grounds of the Elms Hotel. Views of operations at this clinic were shown in the September, 1940, issue.

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXVI APRIL, 1941 No. 4

During 1918 the French army in the Vosges Mountains used more than 8,000 sledge dogs.

A ship containing a consignment of 500,000 doses of influenza vaccine to England was torpedoed enroute recently and all the vaccine was lost.

In war dogs are used as sentinels with front line troops, as guards with patrols, as messengers, to locate the wounded, to carry ammunition and other supplies to organizations in situations where other means of transport fail.

The military personnel of the United States — admittedly better fed than any other army in the world—eats considerably more than twice as much meat as any group of the civil population. The naval personnel eats even more meat than the military.

When all the known B complex vitamins were added to the Goldberger pellagra-producing diet at the Wisconsin station, chicks fed upon it did not grow as fast as when in their stead yeast was added to an extent of 5%. This indicates that yeast contains as yet unknown vitamins.

It will be necessary to learn how to regulate the dose of gonadotropic hormones more accurately than is known at present if they are to have practical value in the breeding of "shy breeding" cows.

Three cows, given hormones and artificially inseminated at the Wisconsin station, were found to be carrying "litters" of calves when killed and autopsied from four to six weeks later. One had seven living fetuses, one four, and the other three. Indications were that these cows had ovulated nine, four and six eggs, respectively.

Dogs need seven of the B group of vitamins—thiamin (B_1), riboflavin (B_2, G), nicotinic acid, pyridoxine (B_6), factor W, pantothenic acid, and an unnamed factor. Biochemists at the Wisconsin station added the last two, to the foregoing list of vitamin requirements of the dog during 1940.

Some evidence has been found that a lack of vitamin A in the ration of cattle may secondarily induce vitamin C deficiency such as often causes sterility in bulls. The exact relationship of the two vitamins is not understood, but that there is some connection is undoubted.

Nicotinic acid, the pellagra-preventive vitamin, and riboflavin (vitamin B_2 or G), are usually associated with thiamin (vitamin B_1) in foods. Thus where thiamin deficiency develops there is likely to be a deficiency of nicotinic acid and riboflavin also, particularly in extreme cases such as fright disease in dogs. It follows therefore that fright disease as it occurs in the field is commonly a multiple vitamin deficiency—a thiamin, nicotinic acid and riboflavin deficiency, and frequently a vitamin A deficiency also.

The United States Army has purchased 20,000 horses and mules in the past six months, and will acquire 7,000 additional in the near future. Sound animals of good conformation, four to eight years of age, weighing 1,050 to 1,300 pounds and from 15-1 to 16-1 hands are required. From one-half to seven-eighths thorobred is preferred. The price averages $165 per animal. Three-fourths of the horses purchased by the army are the get of Remount stallions, of which the army owns 700, practically all thorobreds. All animals must be examined by a veterinary officer and pronounced sound and within the age limits before purchase.

Hooker and Boyd have succeeded in producing antibodies specific for strychnine from rabbits injected with mono-amino-strychnine-azohaemocyanim. Although the antisera which they obtained was too weak to neutralize the lethal effect of strychnine in any reasonable dose, their work may pave the way to the development of effective specific antisera for strychnine poisoning.

* * * *

Research workers at the University of North Carolina are reported to have found the fumes of ordinary motor-fuel gasoline (not leaded) to be a satisfactory anesthetic for white rats and promising for dogs. The rats were rendered completely unconscious in five to seven minutes and revived in the same period after the anesthetic was withdrawn. No nausea or other ill effects were produced by the gasoline fumes.

* * * *

Science has not yet come to the point where it can make a good diet out of a very poor one by adding specific vitamins. It is far safer to include in the diet a good proportion of such protective natural foods as milk, meat, fruit, and vegetables, which contain both known and unknown vitamins.—*Wisc. Agr. Exp. Sta.*

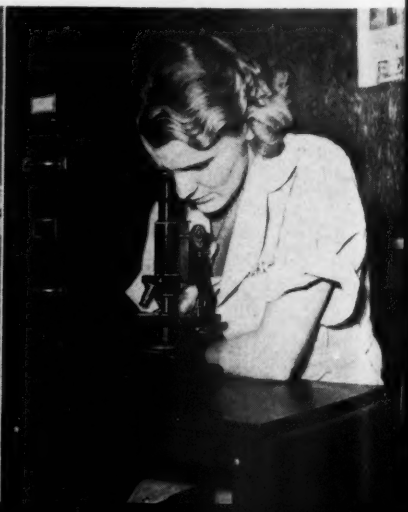
A BUSY VETERINARY TEAM

Left: Drs. Peck and Peck, Indiana's only husband-and-wife veterinary team, are immunizing a pup against distemper. Located in the heart of a great farming community, they treat not only all farm animals, but pets as well

Dr. Elizabeth Peck was a city-bred girl from New Jersey when she enrolled at the College of Veterinary Medicine, Ohio State University. There she met Ed Peck, also a veterinary student, who hailed from a western state. Both were interested in veterinary medicine, each in the other. They were married in their junior year. After graduation they took over a small building at Decatur, Indiana, and remodeled it into a home, laboratory, hospital, and office

Below, left: Dr. Ed Peck is fraternizing with a dog he has treated. Next door is a hen and the cage next to the hen is occupied by a cat suffering from a leg fracture

Below, right: Dr. Elizabeth Peck makes the microscopic examinations for the firm. She is the only woman in Indiana holding a license to practice veterinary medicine. In addition to her professional duties, she finds time to take good care of her home and of the recently-arrived third member of the Peck team (O. S. U. '64)



Distinguished Teacher, Editor, Scientist Dies

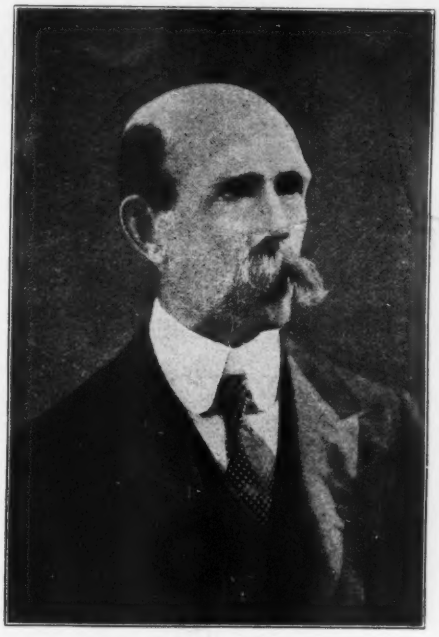
Belated reports from England announce the death of Sir John M'Fadyean, February 1, 1941, in his 88th year. No one in history has influenced the course of veterinary medicine more than he. Qualifying at the Royal (Dick) Veterinary College, Edinburgh, in 1876, he served as lecturer in anatomy in that institution 1876-92 and as professor of pathology and bacteriology in the Royal Veterinary College, London, 1892-1927. From 1894 to his retirement in 1927 he was principal of the London school. Thus he was actively engaged in veterinary education in two of the leading schools of Britain for a period of 51 years. In 1888 he established the *Journal of Comparative Pathology and Therapeutics* and edited it almost single-handed to the outbreak of the present war in Europe, a period of 52 years. Throughout his whole professional career, Sir John was engaged in research in various branches of veterinary medicine. His labors in the field of research were astonishingly productive.

On the occasion of completing the 50th volume of the *Journal of Comparative Medicine and Therapeutics*, friends issued a festival number containing tributes to Prof. M'Fadyean from leaders in the veterinary profession the world over. On that occasion Chief Mohler said of him:

As I write this appreciation of Sir John M'Fadyean and his work, I have before me upwards of a hundred library references to his technical writings, editorials, and addresses covering a vast range of subjects with which he has dealt during the last half-century. These reference cards are well worn, showing constant use by our scientific staff. The scope of his researches would do justice to a vast organization, and it seems scarcely credible that one man has been so versatile. The mere indexing of subjects which he has studied exhaustively requires most of the alphabet. The geographical application is world-wide.

From a scientific standpoint one promptly observes that Sir John has delved not only into pathology and therapeutics, but has explored also bio-chemistry, immunology, parasitology and related scientific territory. More than that, it is noteworthy that he has not been content with challenging minor foes of the animal world, but has selected for scientific attack most of the major live stock enemies. Anthrax, blackleg, cancer, glanders, hog cholera, epizootic abortion, pneumonia, tuberculosis, and many others have been the objects of his aggressive attack.

Moreover, Sir John M'Fadyean emerges from his exploits in scientific pioneering as a leader in modern thought. The modern concept of effective veterinary work centers on sanitary and other preventive procedures—and I think of Sir John M'Fadyean largely as a live stock sanitarian. He has paid particular attention to prophylactic measures. Among his classical studies are those on preventing contamination of milk by pathogenic organisms, prompt diagnosis of diseases in their early stages, and protective immunization.



Sir John M'Fadyean, 1853-1941
(M.B., B.Sc., M.R.C.V.S., LL.D., F.R.S.E.)

The photograph reproduced above, taken about 30 years ago, was used in the October, 1914, issue of VETERINARY MEDICINE in the account of the X International Veterinary Congress

Here in the United States we have looked upon Sir John's work as dependable bedrock on which to build.

Sir John was president of the X and XI International Veterinary Congresses in 1914 and 1930, and four times president of the Royal College of Veterinary Medicine. Additional biographical data may be found in VETERINARY MEDICINE for October, 1914, p. 725; October, 1927, p. 305; and November, 1938, p. 483.

War and the Progress of Science

Manufacturing pharmacy in America has been a child of wars. It was born during the Revolutionary War. It took the decisive step from childhood to manhood in consequence of the Civil War and because independent of Europe and dominant in the world market after the First World War.—*History of Pharmacy.*

The foregoing recalls forcibly a statement in the *Veterinary Military History of the United States* concerning the effect of war on the progress of veterinary medicine in this country. The quotation follows:

The blunt assertion that the basic veterinary history of the supposedly tranquil United States is more military than civil, is startling but true. Facts support no other view. The genesis of veterinary medicine in this country naturally falls into three epochs, which are sharply divided by great conflicts of arms:

1. The Revolutionary War, which separates all American history from the colonial period, led to the development of a tremendous livestock industry. Foreign wars soon ceased in North American territory and a great domain for immigration was created. The military operation of 1776-83 established the field for the present veterinary profession.

2. The Civil War gave birth to the veterinary profession, *ex necessitate rei.* Notwithstanding that the annual production of domesticated animals exceeded 100,000,000, the food and clothing supply of the American people had become precarious in the absence of a system of disease control among them. A veterinary-medical organization was established to plan systematic disease control among animals and schools were founded to furnish the necessary personnel.

3. The World War exposed to the public for the first time, the weakness of the veterinary educational system and established an entirely new era of American veterinary history. The Surgeon General of the Army took disciplinary action to correct the veterinary educational system; private colleges toppled, one after another, leaving all veterinary instruction to publicly supported institutions.

Within these three distinct epochs, other wars have had their effects. European conflicts opened to the veterinary profession the great Middlewest, and the Mexican War, the great Southwest and the Pacific Coast. The Spanish-American War and the Philippine Insurrection drew attention to the importance of a veterinary service in the Army and again emphasized the danger of armies spreading disease among the animals of the civilian population.

In the lives of nations, wars have always laid the ground work for the civil activities between them. Conflicts at arms have been the leading factors in the development of the veterinary profession of the United States; notwithstanding impressions to the contrary that are entertained. "Veterinary-Military History of the United States" seems to be an appropriate title for the annals of animal medicine in this country.

Of course, it is unnecessary to state that war is the greatest calamity that can happen to a free people, short of loss of their freedom, but in the supreme and united national effort that conflict engenders there are many opportunities for gains in the social, economic and scientific fields. They should be grasped and exploited to the full, thus salvaging something of worth from the catastrophe. In the past no other sciences have profited more than or as much as chemistry and medicine from the holocaust of war. However, such progress does not come from accident, but as a result of careful planning. This is one of several reasons why the veterinary profession of this country should never lose interest in the Army Veterinary Corps. The time may come when the military branch is the most important branch of the profession and able to contribute much to its advancement, prestige, and well being.

To derive the most that is possible in medical progress from the wars in Europe and Asia, and from our own national defense program the American Medical Association has established a new publication—*War Medicine*—in which will be collected and collated the medical experiences and discoveries, from these military enterprises that give promise of blessings for mankind in peace as well as war. The veterinary profession has no publication whose special mission is to do this for veterinary medicine but this magazine will endeavor to perform this function in this crisis as it performed it with conspicuous success in World War I.

VETERINARY STAFF, COLORADO STATE COLLEGE

Front row (seated), left to right: K. W. Smith; H. W. Johnson; Floyd Cross; Geo. H. Glover, Dean Emeritus; I. E. Newsom, Dean; R. F. Bourne; Hilton A. Smith; Ruth Sumner; Dudley P. Glick
Back row (standing), left to right: Alice Seeley; Alberta Bonnett; Walter N. Gonick; Alvin B. Hoerlein; Frank X. Gassner; G. S. Harshfield; Ada May Guard; Willa Fraser; R. W. Davis; John C. Williams; T. D. Kroner. Staff members absent when the photograph was taken include: James Farquharson, A. W. Deem, and H. E. Kingman

Experimentation and clinical experience demonstrate that susceptibility to many infections is closely associated with the quality of nutrition.

* * * *

Chastek Paralysis of Foxes

"Chastek paralysis," a disease which has taken a heavy toll of valuable silver foxes in Wisconsin, is caused by feeding some kinds of raw fish, such as smelt, carp, suckers, and perhaps some other species. It can be prevented by cooking the fish before feeding, or by using canned or heat-processed fish.

Chastek paralysis often has been blamed on lack of vitamin B_1 or thiamin. Now it is clear that, on rations containing no raw fish, thiamin deficiency is not likely to appear. Foxes have been kept as long as five months on rations lacking this vitamin, with no worse symptoms appearing than slow growth and poor fur quality.

On the other hand, there is some evidence to show that thiamin deficiency may be the immediate cause of Chastek paralysis on raw fish rations. The most likely explanation at present seems to be that some factor in raw fish interferes with utilization of thiamin, but further work is needed to confirm this hypothesis according to Coombes, Wisnicky and Hart of the Wisconsin Station.

Pantothenic acid and pyridoxine (vitamin B_6) are two recently isolated members of the vitamin B group. Their functions are but imperfectly known. As indicated by its name, the former occurs everywhere. It is probably necessary to all life, plant or animal, high or low forms. Specifically it cures the condition known as chick pellagra and there is evidence that it is essential to the functioning of the adrenals. Pyridoxine is needed for the prevention of dermatitis in rats and is believed by some to be useful in the treatment of pellagra in man.

* * * *

Veterinary Service Essential to Live Stock Industry

Veterinary service is more important today than it ever has been in the history of the United States, not so much in the treating of individual cases of sickness in live stock, as in the control and eradication of dangerous communicable diseases, and in sanitary supervision of the meat food supply of the nation. If dangerous communicable disease of live stock were allowed to go unchecked under present-day conditions it would be but a very short time until the profitable raising of live stock would be a thing of the past, with resultant financial chaos to the nation.—*W. J. Butler.*

LIVE STOCK SANITARY OFFICIALS

Meet the chief live stock sanitary officials in 20 different states (see preceding page). Left to right:

***Top Row.*—C. U. Duckworth, Chief, Division of Animal Industry, California; W. J. Butler, State Veterinary Surgeon, Montana; R. M. Gow, State Veterinarian, Colorado; R. W. Smith, State Veterinarian, New Hampshire.**

***Second Row.*—H. D. Port, State Veterinarian, Wyoming; William Moore, State Veterinarian, North Carolina; W. H. Hendricks, State Veterinarian, Utah; H. A. Seidell, State Veterinarian, Iowa.**

***Third Row.*—J. V. Knapp, State Veterinarian, Florida; R. A. Hendershott, Chief, Bureau of Animal Industry, New Jersey; Mark Welsh, Director, Live Stock Sanitary Service, Maryland; J. M. Sutton, State Veterinarian, Georgia.**

***Fourth Row.*—J. L. Axby, State Veterinarian, Indiana; V. S. Larson, State Veterinarian, Wisconsin; C. D. Stubbs, State Veterinarian, Arkansas; I. S. McAdory, Associate State Veterinarian, Alabama.**

***Fifth Row.*—H. C. Rinehart, Chief Veterinarian, Illinois; E. T. Faulder, Director, Bureau of Animal Industry, New York; W. K. Lewis, State Veterinarian, South Carolina; T. O. Booth, Chief Veterinarian, Texas.**

The addresses in all instances are at the state capital, except for Drs. Smith (Laconia, N. H.), Welsh (College Park, Md.), McAdory (Auburn, Ala.), and Booth (Live Stock Sanitary Commission, Fort Worth, Tex.). Drs. Stubbs and Rinehart have tendered their resignations recently. Their resignations have not yet been accepted, but it is assumed their successors will be appointed soon.

Vitamin C Often Cures Sterility in Bulls

Slow-breeding and low-potency bulls have responded remarkably to injections of ascorbic acid, the pure form of vitamin C. No less than 24 of 29 such bulls showed improvement after treatment, report Paul Phillips and associates.

Ascorbic acid injection generally had these effects: (1) The ascorbic acid content of the animal's semen and blood plasma increased, moving into the normal range. (2) The quality and character of the semen was greatly improved, the life of the sperm in yolk-buffer solution being increased three-fold. (3) The activity and sex behavior of most bulls were stimulated.

Impotent bulls are treated by injecting them twice a week with at least one gram of ascorbic acid per 1000 lbs. of live weight. Before being injected, crystalline ascorbic acid first is dissolved, using any one of three solvents — sodium-potassium-phosphate buffer, such as is used in making yolk-buffer for preserving semen; physiologic saline solution; or sterile water.

Bulls may respond to the first injection, or it may require considerable time to get results. In persistent cases it is well to use ascorbic acid liberally, particularly since an excess is not likely to cause any harm.

It seems to be necessary to inject ascorbic acid hypodermically, since feeding this vitamin has not improved the potency of bulls. Ascorbic acid is destroyed in the rumen of cattle before it can be absorbed.—*Wisc. Agr. Exp. Sta. Bul.* 450.

Preservation and Evaluation of Bull Semen

Phillips and Lardy of the Wisconsin station have developed a far better preservative for bull semen than has been used heretofore. The new practice is to place one part of semen in three parts of a solution made up of egg yolk to nourish the sperm cells, and a sodium-potassium-phosphate buffer to bring about a pH of 6.7 to 6.8, which is most favorable for sperm. The material is then kept at a refrigerator temperature of 41 to 50°F. By the new method good quality semen can be kept for 200 hours or longer. Under methods previously used, bull semen preserved for longer than 12 hours has proved unsatisfactory for artificial insemination. The ingredients for making up the buffer solution are available in capsule form.

Whether or not a bull is fertile can be learned with reasonable accuracy by determining the amount of ascorbic acid in the semen and in the blood plasma, in addition to microscopic study of the spermatozoa.

The Phillips-Lardy Standards for the evaluation of semen and potency in the bull are:

1. The ascorbic acid content of the blood plasma should range between 0.2 and 0.4 milligrams per 100cc.

2. The ascorbic acid content of the semen should range between 3 and 7 milligrams per 100cc.

3. If microscopic examination shows the sperm is alive after storage of 200 hours or more in yolk-buffer solution, it indicates excellent potency. Sperm that can be stored for 150 to 200 hours may be considered good; 100 to 150 hours, fair; and less than 100, poor.

ANNUAL BANQUET, NATIONAL ASSOCIATION OF BUREAU OF ANIMAL INDUSTRY VETERINARIANS
Speakers' Table, left to right: A. E. Wight, Chief, Tuberculosis Eradication Division, B. A. I.; H. D. Port, State Veterinarian, Wyoming; A. J. De Fosset, Inspector in Charge for Ohio; J. H. Healy, Inspector in Charge for Wisconsin, toastmaster; the entertainer; A. W. Miller, Chief, Interstate Inspection Division B.A.I.; Aine E. Cameron, Head, Health of Animals Branch, Canada; Mark Welsh, State Veterinarian, Maryland. L. A. Merillat (not shown in the photograph) was also at the speakers' table. This banquet is held regularly in Chicago during the meeting of the United States Live Stock Sanitary Association. Wight is president of the A. V. M. A., Port president (1940) of the U. S. L. S. S. A., De Fosset president of the N. A. B. A. I. V., Welsh secretary of the U. S. L. S. S. A., and Merillat executive secretary (1940) of the A. V. M. A.

When veterinary deans get together they discuss such subjects as: (1) federal aid for veterinary schools, (2) the "general test" in U. S. Civil Service Examinations, (3) pre-veterinary standards and requirements, (4) veterinary interneships, (5) geographical distribution of veterinary students, (6) exchange of veterinary students, and (7) commencement academic regalia.

Most deans favor the enrollment of some non-resident students to make the group more cosmopolitan. Some achieve this by setting the entrance standard so high that it eliminates many resident applicants but permits academically high-ranking non-residents to be admitted. Not more than 10 to 15% of out-of-state students is considered desirable.

* * * *

It has been determined at the Montana station that mastitis (blue bag) in range sheep is a contagion due to a Pasteurella organism. The organism is found in the circulating blood during the acute stage of the disease, but disappears from the blood in a week. In the later stages pyogenes are also present. The disease is always unilateral. A very small amount of a swab taken from a Pasteurella culture and touched to the external teat orifice produces the disease in 24 hours. Hadleigh Marsh believes that the organism injected subcutaneously may constitute an immunizing method. This, however, is not as yet a practical method of immunization, nor is it free from potential hazard, but since immunity can be thus established, there is hope for developing a practical method of immunization. At this time only sanitary methods of control are known.

The tuberculosis eradication project cost the federal government $89,000,000 and the state governments $184,000,000, a total of 273 million dollars, from its inauguration in 1918 to the close of the fiscal year June 30, 1940. It is thought that the incidence of tuberculosis in cattle is approximately 0.46% in this country at the present time.

* * * *

In an experiment in which 12 lots of 50 chickens each were fed oats, barley, wheat and corn at the Beltsville Research Center, these grains ranked in the order named in the amount of gain produced. There were small differences between the first three, but corn was distinctly inferior to the others when fed as the sole grain in the ration. The addition of 20% oat hulls to the corn rendered it equal to the others in feed value for chickens.

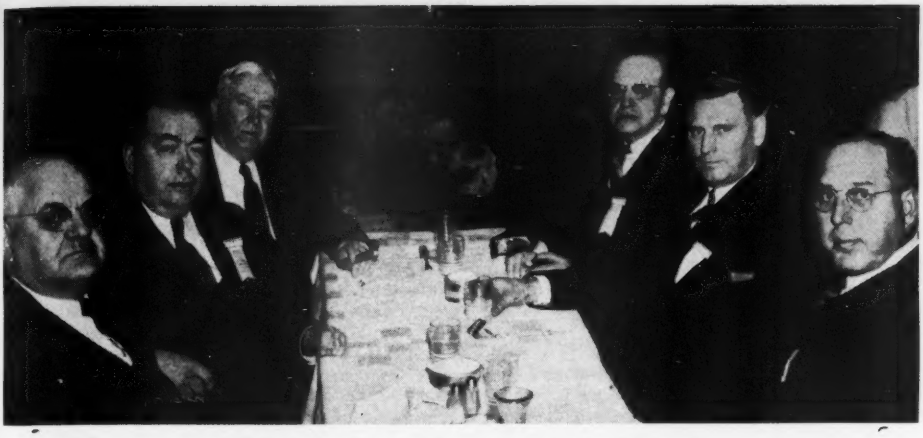
* * * *

Changes at Veterinary College of Eire

Professor J. J. O'Connor, Principal of the Veterinary College of Ireland, Dublin, having reached the age of retirement on January 6th, was succeeded by Prof. Thomas G. Brown.

Principal O'Connor was graduated from the Royal (Dick) Veterinary College in 1899 and appointed professor of surgery in the Dublin institution in 1922. In 1935 he became principal. He is best known in this country for his revision of Dollar's *Veterinary Surgery*, which has had a wide distribution among American veterinarians.

Principal Brown is a graduate (1913) of the school he now heads, and has been professor of anatomy in it since 1915. The Dublin school's students number about 250.



GOOD FEEDERS AT THE N. A. B. A. I. V. BANQUET

Left to right: E. A. Crossman, Dean of the Veterinary School of Middlesex University; A. J. Sullivan, B. A. I. Inspector in Charge for Indiana; C. N. McBryde, Director of the B. A. I. Experiment Station, Ames, Ia.; H. J. Shore, Ft. Dodge Biological Laboratories, Ft. Dodge, Ia.; Sam Foster, B. A. I., Portland, Ore.; Guy G. Graham, President, Jensen-Salsbery Laboratories

This is one of the tables at the annual banquet of the National Association of Bureau of Animal Industry Veterinarians. Doctor Crossman is President (1941) of the U. S. Live Stock Sanitary Association, which participated in the banquet at the invitation of the Bureau veterinarians

The cost of cod-liver oil and of ultraviolet radiation by an S-4 type sunlamp as a source of vitamin D for growing chicks and turkeys was approximately the same in a two-year experiment conducted by the Ohio station. For laying hens the cost of the light was considerably greater. However, the hens laid more eggs and the hatchability of the eggs was greater with the light source.

Cause of Sweet Clover Disease Identified

Research workers at the Agricultural Experiment Station, University of Wisconsin, have ended the long search for the toxic principle in damaged sweet clover hay that prevents blood clotting in cattle fed upon the hay. They determined it to be a derivative of coumarin, the substance that gives sweet clover its bitter taste. Coumarin itself is non-toxic, but when sweet clover undergoes spoilage, some of the coumarin is changed into a toxic substance—a powerful anticoagulant. It is probable that by selective plant breeding much of the coumarin naturally occurring in sweet clover can be bred out of it, thus improving its palatability and lessening the hazard in feeding it.

Optimum nutrition is the best assurance for buoyant health.

In the daily diet of the individual, no food can compare with milk as a builder of health. Because it is easily digested and readily assimilated, and also because it contains almost all of the essential nutrient elements, milk is practically indispensable for the daily diet of children of the preschool age. For growing school children and those in their 'teen years who are approaching their full maturity, there is no food as substantial as milk to furnish them with both energy and growth-promoting properties.—*Adams Cohen, M.D.*

Urea has proved equal to linseed oil meal when used to supplement a low-protein ration for dairy cows in an uncompleted experiment at the Wisconsin station. Evidence was found that the urea, a simple nitrogen compound, is converted into protein by bacterial action in the fore-stomachs of the cow. No ill effects developed from feeding urea as the protein part of the ration of dairy cows for one year.

VETERINARY RESERVE OFFICERS STUDY COURTS-MARTIAL PROCEDURE

Front Row (left to right): 1st Lts. C. H. Koll and J. R. Hathaway, Lt. Col. J. R. Sperry, Capt. G. H. Todd, 1st Lt. H. A. Jokerst. Back Row: 1st Lts. J. H. Watson and W. S. Houk, Pvt. 1 cl. C. A. Matson, 1st Lt. M. J. Jones

This was the last meeting of the class in a course in Courts-Martial Procedure. It consisted of a mock court. Col. J. R. Sperry was president of the court, Captain Todd and Lieutenants Koll, Hathaway, Jokerst and Watson members, Lieutenant Houk Judge Advocate, Lieutenant Jones Defense Counsel, and Pvt. Mason the accused. The trial was concluded and the witnesses excused at the time the photograph was taken. Colonel Sperry is the Regular Army instructor of the class. Pvt. Matson is also of the Regular Army (Veterinary Service). The others are Reserve Officers. The trial lasted three and one-half hours. It was held on Saturday afternoon, which seems to indicate that Saturday half-holidays are not always observed by Reserve Officers during present training

Phenothiazine

The sensational achievements of phenothiazine in the field of anthelmintics during the past three years and the interest they have attracted have resulted in an extraordinary amount of research into its usefulness. Already the literature of veterinary medicine and of parasitology contains more than 50 reports of scientific experiments to determine its value in combating parasitic infestation of animals. All have dealt with its oral administration for intestinal parasitism of the various species of domestic animals. Although it may be effective for external parasitisms, entirely satisfactory and less expensive treatments for these conditions being available, it is not likely to find more than a limited field of usefulness here.

The extensive use of phenothiazine therapeutically by veterinary practitioners and live stock owners in the short period since its efficacy has been known is astonishing. Some distributors are already ordering it from the manufacturers in carload lots. The wide margin between the therapeutic and the toxic dose of phenothiazine and the fact that it may be administered in the feed for herd treatment indicates that this remedy will in time come to be used chiefly by the live stock owner for suspected parasitism rather than by veterinarians for definitely diagnosed cases of parasitic infestation.

It is still too early to make definite statements concerning the extent and limitations of its field—as to the indications and contraindications of this remarkable drug—in combating the ravages of parasites of domestic animals, but the following represent the consensus at this time.

Horses

In single doses of 50 grams for animals weighing 1000 to 1500 pounds it is:

1. Ninety per cent to 100% effective against strongyles (which include some 58 species of nematodes that inhabit the large intestine of the horse) and certain stomach worms—*Habronema megastoma, H. microstoma, H. muscae* (but not *Trichostrongylus axei*).

2. Ineffective against tapeworms (*Anoplacephala mammillana, A. magna*), bots (*Gastrophilus intestinalis, G. nasalis, G. hemorrhoidalis*), and strongyloid worms (*Strongyloides westeri*) of suckling foals.

3. Reports are conflicting as to its effectiveness against ascarids (*Ascaris equorum*), the stomach worm *Trichostrongylus axei*, and pinworms *(Oxyuris equi)*, ranging from 100% effective to worthless.

The drug probably causes a transient (four weeks) anemia. It may be given to pregnant mares at any time up to the tenth month of gestation; in this respect it possesses a great advantage over carbon tetra-

chloride and oil of chenopodium. A number of deaths of horses have followed the administration of phenothiazine. The factor or factors responsible for the deaths have not been finally determined.

Cattle

In single doses of 100 grams for mature animals and 25 to 50 grams for calves, phenothiazine is:

1. Ninety per cent to 100% effective against the commoner stomach worms (*T. axei, Haemonchus contortus,* and *Ostertagia ostertagi*).

2. Only moderately effective against the hookworm (*Bunostomum phlebotomum*) and Cooperia intestinal worm (*Cooperia* spp.).

3. Ineffective against the strongyloid worm (*Strongyloides papillosus*), tapeworms (*Moniezia* spp.), and whipworm (*Trichuris ovis*).

Sheep

In single doses of one-half gram per pound of body weight phenothiazine is:

1. Nearly 100% effective against stomach worms and nodular worms.

2. Somewhat less effective against hookworms (*Bunostomum trigonacephalum*) and Cooperia worms (*Cooperia,* 4 spp.).

3. Reports are conflicting as to its effectiveness against the thread-necked worms (*Nematodirus,* 4 spp.).

4. Ineffective against whipworms (*Trichuris ovis*), flukes (*Fasciola hepatica*), and tapeworms (*Moniezia,* 2 spp.).

Swine

In single doses of from five grams for 25-pound pigs to 30 grams for 200-pound hogs phenothiazine is:

1. Ninety per cent to 100% effective against nodular worms (*Oesophagostomum,* 5 spp.), and mature ascarids (*Ascaris suis*). The treatment should be repeated in one to two months to eliminate ascarids that are immature when the first dose is given.

2. Ineffective for the other common intestinal parasites of swine and for trichina worms (*Trichinella spiralis*).

Dogs and Cats

So far no useful place has been found for phenothiazine in the treatment of parasitisms in the dog and cat.

Poultry

In doses of 0.05 to 0.5 grams per bird, phenothiazine has been found to be highly effective against cecal worms (*Heterakis gallinae*) infestation of chickens, and from clinical reports appears to be equally effective in turkeys.

The fact should not be lost sight of that all published reports on phenothiazine to date have dealt with controlled experiments. Judgment by the court of last resort, the clinicians, has not yet been rendered. In view of that fact the optimism reflected in the foregoing summary may not be justified. Further, as with the use of other parasiticides it must be remembered that the control of parasites comprises more than the administration of the drug, however effective it may be. At this writing phenothiazine is being listed in mail order catalogs, extolled in farm papers, and recommended without qualification to live stock owners for their own use. It will probably be able to survive the ballyhoo of its friends, but it may first have to pass through a period of discredit just as intense (and just as unmerited) as its period of indiscriminate favor.

Phenothiazine is eliminated to the extent of approximately 50% in the feces and 50% (as thionol or leuco-thionol) in the urine. Thionol is a dye and imparts a red color to the urine at the time it is voided or soon afterward. Thionol is strongly antiseptic and is used in human medicine as a urinary antiseptic. So far the use of phenothiazine for its antiseptic action in the urinary tract has not been reported in veterinary medicine.

* * * *

The use of blood sedimentation as a herd test in connection with the clinical symptoms is of value in the diagnosis of equine infectious anemia, in the opinion of E. A. Tunnicliff of the Montana station. It is a viscosity test—some horsemen even claim that the blood of animals suffering from swamp fever is more than ordinarily "sticky." Unfortunately the test is not suitable as an individual test and it is a better means of diagnosis in the case of the individual that is needed.

Cooperative Plans for the Control of Bovine Brucellosis in Ontario*

By C. D. McGILVRAY, Guelph, Ontario
Principal of Ontario Veterinary College

IN the control of Bang's disease, herds may be regarded as coming under two main groups:

1. Herds which are free from the disease.

2. Herds which are affected.

1. Herds which are free from the disease: These herds must prove negative to the agglutination test and every precaution must be taken to prevent them from becoming infected through possible exposure. Owners of such herds may by arrangement with the Health of Animals Branch have their herds tested and listed as negative herds free from Bang's disease. Under this arrangement such herds come under the supervision and jurisdiction of the Health of Animals Branch of the Dominion Government.

2. Herds which are affected: In the case of affected herds, the progress of the disease may be regarded as occurring in three phases or stages:

A. The Introductory Stage.—This phase represents the early period of the disease in a herd following the introduction of the infection. At the beginning there may be only a few abortions. It usually occupies a period of about one year. In the testing of these herds the percentage of reactors is usually under 10%. It is the opportune time to have the herd tested and the reactors removed. The testing of the herd should be repeated at regular intervals of from 30 to 60 days until all of the infected animals are detected and removed. The premises must be cleaned and disinfected each time following the removal of the reacting cattle.

B. The Spreading Stage.—During this period the infection is becoming more widely disseminated in the herd. This phase of the disease is manifested by an increase in the abortion rate. It may also be characterized by what is commonly known as an "abortion storm" or "acute outbreak" wherein a very large percentage of the pregnant animals abort in succession. The abortion rate during this stage generally exceeds 10% and may reach 50% or even more. In dealing with a herd during this stage the test may reveal the majority of the herd to be infected. The owner may be unable to adopt a radical plan of dealing with the reactors and it is not always an opportune time to advocate such procedure.

C. The Regressive Stage.—During this period the disease has become chronic in the herd and the actual abortion rate has decreased. This phase of the disease is of long duration and continues indefinitely. It is characterized by many of the adult cows acquiring a high degree of resistance and a reduction of the virulence of the infection also may take place. If a herd of this kind is tested the majority of the adult cows may react although their breeding record may be consistently good. The abortion rate is then largely confined to the young females during their first or second pregnancies. This is the type of herd in which calfhood vaccination is being advocated as an aid in controlling the disease without too great a material sacrifice of highly valuable breeding animals until they can be replaced by the vaccinated offspring.

In co-operation with live stock breeders and practicing veterinarians, the following plans are provided for the detection and control of Bang's disease.

A. Routine testing of individual herds.

B. Supervised testing of herds in prescribed areas.

C. Supervised calfhood vaccination.

A. Routine Testing of Individual Herds.—This plan is available for the blood testing of herds by veterinarians in general practice for their clients. The blood samples are submitted by the veterinarian and the blood tests are made by the college staff. The results of the tests are reported on test charts

* Presented at the Eighteenth Annual Post-Graduate Conference for Veterinarians, Michigan State College, East Lansing, Jan. 27-31, 1941.

furnished by the college. The tests conducted under this plan during the current years are as follows:

Total number of cattle tested	83,479
Total number of cattle negative (Approximately 82%)	68,130
Total number of cattle positive (Approximately 13%)	11,067
Total number of cattle doubtful (Approximately 5%)	4,282

B Supervised Testing of Herds in Prescribed Areas.—Where a sufficient number of owners in a prescribed area desire to have their herds tested and supervised for the control of bovine brucellosis, the Department of Agriculture, through the Ontario Veterinary College, will cooperate with owners and their veterinarians under the following arrangement:

1. That a group of 10 or more owners occupying contiguous premises in a prescribed area may submit a petition or signed request on a form supplied by the Department signifying their desire to have their herds tested for the control of brucellosis under the supervision of a qualified registered veterinarian.

2. Under the proposed plan the Department will assume payment of the veterinarian's fees at the rate of 20 cents for each animal tested or any other basis mutually agreeable, and will also provide the necessary test charts, the sterilized vials for the blood samples, and make the required agglutination tests, free of charge.

3. The cost or expense of any additional work or extra visits by the attending veterinarian, apart from that required in the actual testing of cattle, shall be borne entirely by the owner of the herd.

4. That owners will agree to have their herds placed under either one of the following plans, depending on the extent to which they are affected, as shown by the test results:

Terms Under Which Herds Are Accepted

Plan A:

1. By having all cattle in the herd over 12 months of age blood tested.

2. If less than 10% of the herd reacts to the test, that the reactors will be immediately removed from the herd.

3. That the herd be retested at intervals of 30 to 60 days until the entire herd is negative.

4. That any additional reactors be likewise removed from the herd.

5. That all reacting cattle be ear-marked with the letter B, or removed under a permit to an abattoir for slaughter without undue delay, and that they be kept segregated pending their removal.

6. That reacting cattle must not be sold to enter other herds in order to prevent them creating new centres of infection or disseminating infection.

7. That new additions to the herd be obtained only from negative herds, or have been submitted to the test before being admitted to the herd, and be kept segregated for 30 days and again tested.

8. That the premises be thoroughly cleaned and disinfected from time to time as may be required.

9. That the cattle showing a definite reaction to the test shall not be retested.

10. That the cattle showing a doubtful reaction to the test shall be retested in

from 30 to 60 days. Animals again doubtful to the retest may then be regarded as reactors and dealt with accordingly.

11. That the cattle not reacting to the initial test shall be retested in from 30 to 60 days after the removal of the reactors.

12. That after a negative test of the entire herd is obtained, the herd shall be submitted to a further test in three months, and again in from three to six months, and to semi-annual tests or annual tests thereafter.

13. That cows shall not be taken to other herds to be bred unless such herds are definitely known to be negative herds and likewise no cows from other herds shall be bred unless they are also from known negative herds.

14. That when all the animals in a herd are negative to the test, owners will then be expected to take the necessary steps to have their herds listed as negative herds under the provisions and regulations of the Health of Animals Branch.

15. That failure on the part of an owner to comply with the purpose and intent of the plan for the control of brucellosis in their herds shall be regarded as sufficient cause for the cancellation of Departmental help and cooperation.

Plan B: 1. In the case of any herd having over 10% reactors, where the owner is unable to bear the immediate sacrifice of so many of his cattle, that an agreement be entered into with the view of ultimately developing a clean negative herd from the non-reactors and the calves with the least material sacrifice.

Areas Established

Under the foregoing arrangement three prescribed areas have been established, known respectively as:

1. Schomberg Area: Includes 120 herds, comprising 1498 cattle.

2. Northumberland Area: Includes 138 herds, comprising 2063 cattle.

3. Durham Area: Includes 31 herds, comprising 348 cattle.

C. Supervised Calfhood Vaccination in Badly Infected Herds.—In this class were included all herds containing over 15% reactors. Vaccination was restricted to calves between four and eight months of age. The vaccine used was Cotton's No. 19 strain *Brucella abortus*. Following vaccination the calves are being tested at regular intervals of from 30 to 60 days until their first gestation period is completed. The experimental or supervised use of vaccination was commenced during May, 1938. Sufficient time has not elapsed to properly determine its true value. This group comprises 68 herds containing 3050 animals, of which 1205 calves were of vaccination age.

TABLE I.—RESULTS OF TESTS IN PRESCRIBED AREAS

No. of Test	Negative	Positive	Doubtful	Total
1. *Schomberg Area*				
1st	1300 (87%)	96 (6%)	102 (7%)	1498
2nd	912 (94%)	14 (1½%)	41 (4½%)	967
3rd	472 (97%)	2 (1%)	12 (2%)	486
4th	58 (95%)	....	3 (5%)	61
2. *Northumberland Area*				
1st	1909 (93%)	84 (4%)	70 (3%)	2063
2nd	550 (96%)	5 (1%)	17 (3%)	572
3rd	256 (92%)	....	21 (8%)	277
4th	14 (100%)	....	....	14
3. *Durham Area*				
1st	308 (89%)	19 (5%)	21 (6%)	348
2nd	115 (92%)	2 (2%)	7 (6%)	124

TABLE II.—RESULT OF THE HERD TESTS BEFORE VACCINATION

Total number of cattle tested	3050
Total number of cattle negative (Approximately (62%)	1873
Total number of cattle positive (Approximately 32%)	990
Total number of cattle doubtful (Approximately 6%)	187

TABLE III.—CALVES TESTED AND VACCINATED BETWEEN FOUR AND EIGHT MONTHS OF AGE

Calves tested before vaccination	1227
Number of calves negative	1090=89%
Number of calves positive	73= 6%
Number of calves doubtful	64= 5%

TABLE IV.—RESULTS OF TESTS FOLLOWING VACCINATION

Test No.	Negative	Positive	Doubtful	Total
1st	312 (29%)	594 (56%)	157 (15%)	1063
2nd	428 (49%)	305 (35%)	132 (16%)	865
3rd	377 (58%)	179 (28%)	87 (14%)	643
4th	251 (59%)	101 (24%)	69 (17%)	421
5th	214 (62%)	78 (22%)	54 (16%)	346
6th	144 (60%)	58 (24%)	39 (16%)	241
7th	140 (62%)	44 (19%)	43 (19%)	227
8th	134 (66%)	35 (18%)	31 (16%)	200
9th	119 (74%)	25 (16%)	16 (10%)	160
10th	62 (55%)	25 (22%)	26 (23%)	113
11th	54 (47%)	28 (24%)	32 (29%)	114
12th	35 (40%)	28 (31%)	25 (29%)	88
13th	33 (56%)	11 (19%)	15 (25%)	59
14th	45 (76%)	9 (15%)	5 (9%)	59
15th	48 (87%)	2 (4%)	5 (9%)	55
16th	43 (98%)	00 (0%)	1 (2%)	44

TABLE V.—BREEDING RECORD OF VACCINATED HEIFERS

Number of vaccinated calves bred and conceived	380
Number of vaccinated calves safely calved, 1st pregnancy	207
Number of vaccinated calves safely calved, 2nd pregnancy	3
Number of vaccinated calves which have aborted, 1st pregnancy	3
Number of vaccinated calves which have aborted, 2nd pregnancy	2

Discussion of Vaccination Results

Owners and their veterinarians were requested to furnish definite particulars as to the results experienced during the last three years. Reports have been received covering the majority of the herds. All are in complete agreement that no ill effects have resulted from the vaccination. In two cases, however, the owners have expressed disappointment in that they had expected all the vaccinated calves in their herds would become negative in two or three months and remain negative thereafter for life. Needless to state, this is altogether too much to expect.

No difficulty has been reported as to the vaccinated heifers failing to conceive. Of the vaccinated heifers, 207 have safely calved following their first pregnancy, and three following the second pregnancy. Only five of the vaccinated heifers have aborted as yet. Vaccinated heifers have been tested at intervals of from 30 to 60 days extending over a period of two years.

The length of time that vaccinated calves may continue to react is extremely variable. As a rule calves vaccinated at or about the minimum age of four months have become negative in a shorter period than those vaccinated at or about the maximum age of eight months. Approximately 75% of the treated calves became negative in from two to four months, while approximately 20% have remained positive for a period varying from four to twelve months and approximately 5% have remained positive or doubtful beyond that length of time.

The treated heifers which have remained negative throughout the first gestation period have calved safely. A few of the vaccinated heifers have intermittently shifted at times from negative to positive or conversely from positive to negative. These apparent vagaries of or to the test may warrant the belief that the ultimate value of calfhood vaccination may require to be appraised on the actual abortion rate in vaccinated heifers as compared with untreated heifers reared in infected herds and similarly exposed to continuous natural infection.

The consensus so far expressed is to the effect that following the adoption of vaccination, the abortion rate is much less in first pregnancy heifers than before vaccination was commenced in the same herds.

Rupture of the Omasum

A three-year-old yellow Jersey cow weighing about 900 pounds calved about March 10, 1940. Three days later rumination had practically ceased, the animal had no appetite, the milk flow was not normal, and she was losing weight rapidly. After drenching the cow twice with magnesium sulfate without any beneficial results, the owner called Dr. T. E. Wilke of West Plains, Mo.

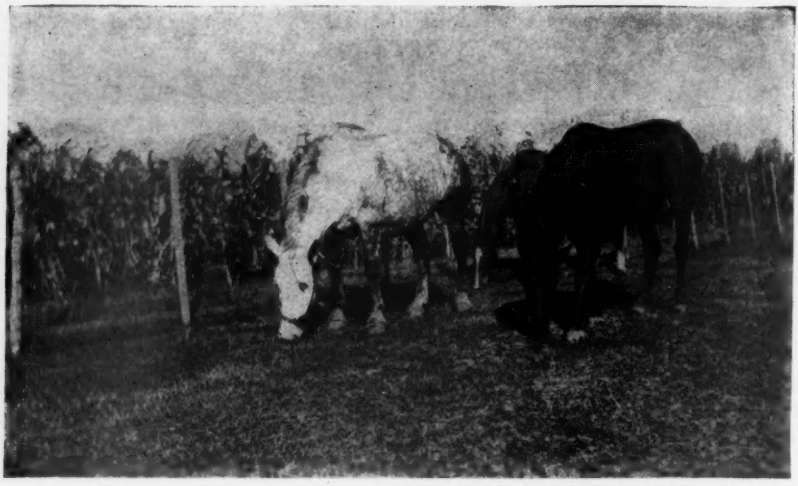
Doctor Wilke made a diagnosis of peritonitis and treated the cow for two weeks before she died. The writer saw the case by invitation. At this time the symptoms of peritonitis were very pronounced. The animal would hardly move unless forced, its back was slightly arched, pain was obvious when pressure was applied to the abdomen, and there was edema ventrally just anterior to the mammary gland. The temperature was 103.1°F, the pulse was 98 and weak, the respirations were 29, and the feces were extraordinarily dark and fetid.

The day after these observations were made the cow died, and with Doctor Wilke's consent the author performed a necropsy. There was an ellipsoid tear in the ventral wall of the omasum, the edges of which had formed thick, heavy adhesions with the ventral abdominal wall and thus kept the contents of the omasum from spreading through the abdominal cavity; these adhesions had apparently broken down, following which secondary fibrinous adhesions had formed throughout the entire abdominal cavity. There was a pinkish exudate in the abdominal cavity, and a foul odor was emitted. No foreign bodies were found.

The author was unable to find any reports in the literature on rupture of the omasum. Because the trouble started shortly after parturition, one might be justified in assuming that straining at this time may have caused it. Other possible factors are foreign bodies or a congenital weakness.

CHARLES RENFROW, K.S.C. '41.
West Plains, Missouri.

Phenothiazine as an Equine Anthelmintic



By B. J. ERRINGTON,[1] Lexington, Kentucky
Department of Animal Pathology
Kentucky Agricultural Experiment Station

ANTHELMINTIC treatment of horses has, of necessity, been quite generally practiced for many years as a routine measure in the horse breeding sections of Kentucky. Apparently the advantages have been greater than the disadvantages, as the horses on most breeding farms are treated one or more times during the year for the common intestinal parasites. In the history of such control measures there have been results which were not encouraging to those concerned. Deaths following the administration of anthelmintics have been reported.[2] Several similar casualities in this area have been unreported. Besides the deaths, there is the frequent complaint that some commonly used anthelmintic treatments cause a severe loss in condition which is not readily regained. Fear of causing abortion in pregnant mares has further limited the use of some common anthelmintics and thus lowered their effectiveness in control measures.

When the horsemen and veterinarians in this area heard favorable reports of the new anthelmintic, phenothiazine, many of them were anxious to use it. Bardwell[3] estimated that over 2,000 horses in Fayette and surrounding counties had been treated with phenothiazine by January 1, 1941. This is a conservative estimate, as one veterinarian alone has treated nearly 1000 animals. Phenothiazine proved to be highly efficient in the elimination of mature strongyles; it is easily administered and has the advantage of not requiring a period of fasting or a cathartic in its use. It therefore promised to be the ideal drug to use for strongyles in horses. Some of the veterinarians and horsemen here, as well as men who did experimental work with the drug,[4] visualized the probability that strongyles could soon be eliminated entirely as a problem in the control of equine parasites. If an efficient, nontoxic drug were available this would certainly be a possibility, as it could be used sufficiently often to break the life cycle of the parasite.

This report concerns our further experimental use of phenothiazine and experiences witnessed with others in this area.

[1] The author is indebted to Mrs. Florence Meier and to Dr. Edgar L. Taylor for technical assistance in the work reported.

[2] Dimock, W. W., P. R. Edwards, and D. W. Bruner, 1940. The occurrence of paratyphoid infection in horses following treatment for intestinal parasites. *Cor. Vet.* 30:3, pp. 319-320.

[3] Bardwell, R. H., 1940. Discussion concerning phenothiazine as an anthelmintic. *The Blood Horse* 35:2, p. 63.

[4] Taylor, E. L., and K. M. Sanderson, 1940. Symposium on phenothiazine. *Vet. Rec.* 52:36, pp. 635-647.

All the phenothiazine used was purchased from commercial veterinary supply companies. The drug was either used as a powder mixed in the grain feed or administered in suspension with bentonite, through a stomach tube.

■ In this area, with the exception of one experimental animal, there have been no casualties reported from the use of phenothiazine. However, our observations indicated that its use was extending beyond definite knowledge concerning the margin of safety. Most of those who have used phenothiazine have been pleased with the results, although occasionally icterus has followed the administration of the drug. Other veterinarians have had animals which required treatment after phenothiazine was used. Some horsemen, assured that the possible harmful results are of minor importance, have used the drug at two-month intervals. The unfavorable reports or their own experiences have influenced many veterinarians to be cautious in the use of the drug or to await further recommendations.

If there are limitations in the use of phenothiazine as an anthelmintic for horses, veterinarians and horsemen should be so informed. It has been proved in this area that if an anthelmintic as efficient as phenothiazine is recommended as non-toxic, the minimum effective dose and the frequency in which it can be safely administered will be little considered. The literature concerning phenothiazine has recently been reviewed by Britton,[5] who says: "Horses are apparently very resistant to any toxic effects which the drug may have and therapeutic doses of from 30 to 120gm have been given without any ill effects whatsoever." It was reported from one source[6] that phenothiazine may not be entirely nontoxic for the equidae in the doses recommended and that some caution should be used until more could be learned concerning the drug. Observations made by us since that time indicate that undesirable reactions do sometimes occur following the administration of phenothiazine to horses.[7]

■ Each of a group of four thoroughbred stallions in excellent condition was given 90gm of phenothiazine from two different sources. They were given no feed in the evening. The drug was mixed in grain in their next feed, given at 2:30 p.m. Two of the animals receiving phenothiazine from one source ate the hay given them in the afternoon, after being dosed. The next day they were off-feed, and anorexia continued for four days. Urine, which was dark brown (almost black) in color, was passed frequently. Hemin crystals were recovered from each urine sample, although no red blood cells were found.[8] Icterus, decreased peristalsis, and dry, mucus-covered feces were observed, and on the third day both horses had mild colic, which continued until each was given one-half gallon of mineral oil the next day. Improvement began the fifth day and they were eating normally the sixth day. The red blood cells of one dropped from an average of 8,690,000 per cmm (two samples on alternate days before dosing) to 6,510,000 the third day, 5,750,000 on the fifth day and 3,810,000 the 22nd day after dosing. On the 33rd day they had increased to 4,500,000 per cmm. The red blood cells of the other animal dropped only from an average of 9,075,000 per cmm before dosing to an average of 8,260,000 per cmm on the third, fifth and 22nd days after dosing.

The other two stallions, receiving phenothiazine from another source, did not go off feed, and their urine, dark, golden-brown in color, contained no hemoglobin. There was no significant drop in their total red cells. On the same farm a yearling and two 2-year-olds receiving 30 grams each, and an aged mare receiving 45 grams from the

[5] Britton, J. W., 1941. The materia medica of phenothiazine. *Cor. Vet.* 31:1, pp. 1-12.

[6] Errington, B. J., and C. Westerfield, 1940. Phenothiazine as an anthelmintic for horses and mules. *Vet. Med.* 35:12, pp. 688-693.

[7] Since this report was written, R. T. Habermann, P. D. Harwood, and W. H. Hunt have published a report on Critical Tests with Phenothiazine as an Anthelmintic in Horses in the February, 1941, issue of the *North American Veterinarian* (22:2, pp. 85-92). Their work again indicates the high efficiency of phenothiazine in removing adult strongyles from horses. They recommend a dose of 50gm. In regard to toxicity they say: "Three horses exhibited no significant symptoms following the administration of 500gm of phenothiazine. Therefore, the therapeutic index is greater than 10:1."

[8] Because urine containing the products of phenothiazine gives a color reaction which may be confused with that of hemoglobinuria, the urine was not considered to contain hemoglobin unless hemin crystals were found. Robert's qualitative test and the sulfosalicylic quantitative test for albumin were used.

same source as the two latter stallions showed no clinical symptoms and little blood change. Phenothiazine powder received from source No. 1 differed considerably in gross appearance from source No. 2 powder. However, powder received later from source No. 2 had the same gross appearance as that received from source No. 1, and there appeared to be no difference in the effects of phenothiazine from the two sources after this time.

Each of four horses, a saddle-bred yearling weighing 620 pounds, a one-half thoroughbred weighing 965 pounds, a grade draft two-year-old weighing 980 pounds and a grade draft two-year-old weighing 1060 pounds, was given 30gm of phenothiazine on the first of each month for four months. In each case the fecal egg count[9] was negative for strongyle eggs a few days after the first dose. In one (the 980-pound two-year-old), the total red cells per cmm dropped from 8,470,000 to 6,920,000 after the first dose, from 6,775,000 to 5,910,000 after the second dose, from 7,030,000 to 4,580,000 after the third dose and from 6,850,000 to 3,130,000 after the fourth dose. The urine was not examined until after the fourth dose. At this time it was dark brown (almost black) in color and contained hemoglobin. She went off feed but continued to eat about half of her usual feed. Her hind legs were stocked at the fetlocks. The mucous membranes were icteric for six days, after which they were very pale. The other three horses showed no clinical symptoms. They had neither hemoglobinuria nor albuminuria after the fourth dose. The only significant drop in total red cells occurred in the 1060-pound two-year-old, in which the total count of 7,470,000 per cmm before the first dose dropped 13 days later to 5,680,000. The count remained about seven million until after the fourth dose, when it again dropped below six million.

An aged thoroughbred mare, in only fair condition, was to be killed because of sterility. Her total red cells per cmm were 8,555,000 and her urine was golden yellow with no albumin, before she received 90gm of phenothiazine. The next day there was anorexia and icterus. The second day the feces were dry and mucus covered, peristalsis slow, pulse 40, temperature 99.4°, and she had mild colic. She had considerable arthritis, which may have been partly the cause of lying down most of the time after being dosed. When she was up she was uneasy, pawing and turning her head around to her side. The urine was dark brown, almost black, and contained hemoglobin. These symptoms continued until the fifth day, when euthanasia was carried out. The total red cell count had dropped to 6,370,000.

On necropsy the serous surface of the intestinal wall was dull. The small intestines contained much straw-colored mucus. There was no gastritis nor congestion of the intestines. The small colon and rectum contained dry, mucus-covered feces. There were many bots, and two tapeworms (*A. perfoliata*), but no ascarids nor strongyles. The kidneys were enlarged (right, 1610gm; left, 1970 gm) and dark red in color. Although microscopic sections of the kidneys showed evidence of such acute inflammation as red cells in the capsulary spaces of the glomeruli and in the tubules, the degenerative changes were so severe as to suggest that a chronic condition had been present at the time of treatment.

A 17-year-old saddle-bred mare in good condition had 40mg per 100cc of albumin in her urine five days after she received 50gm of phenothiazine in suspension with bentonite. There was a drop in her total red cells, but not below the normal range.

Thirty grams of phenothiazine in suspension with bentonite were given to six mares, of which five were pregnant. Three of them also received from one to two quarts of mineral oil at the time of treatment. No albumin was found in the urine of any before treatment. Following treatment, one, a 14-year-old saddle-bred pregnant mare, had albuminuria, which persisted for five days. Her total red cells were 7,660,000 per cmm before treatment and 6,310,000 per cmm four days later. This mare had received one quart of mineral oil. There was no pathological change in the urine of the others, one of which was an aged pregnant

[9] Fecal egg counts were made by the sugar flotation method, as reported in *Vet. Med.* 35:12, p. 688.

mare and the rest three-year-old fillies. The total red cell count of three decreased but did not go below 7,000,000 per cmm. The count in the other two, neither of which

From the Blue Grass Region

had mineral oil, increased following treatment.

An eight-year-old thoroughbred stallion, weighing 1125 pounds, condemned because of poor conformation, was given 75gm of phenothiazine and killed three days later. He ate well and appeared normal after receiving the drug. However, his mucous membranes were icteric and his feces dry. Hemoglobinuria appeared on the second day. At this time his total red cell count had dropped 18% but was still 8,590,000 per cmm. On necropsy there was marked congestion of the small intestines, cecum and colon. The capsule of each kidney peeled with difficulty. The weights of the kidneys were 1250 and 1500 gm. Their surfaces were covered with petechiae and large areas of hemorrhage. There were dark-colored streaks extending from the medulla into the cortex. Microscopic sections of the kidneys showed red cells and albuminous material in the capsulary spaces of the glomeruli and in the tubules, degeneration of the epithelial cells of the tubules, and casts.

■ One group of horses was given a second dose of phenothiazine, as follows: two yearlings, 20gm; one three-year-old 24gm; one three-year-old, 30gm and two aged pregnant mares, 30gm each. Three months previously the yearlings (then sucklings) had received 40gm and the remaining animals 75gm each of phenothiazine. One yearling had 10gm per 100cc of albumin in her urine at the time she received the second dose. There was no albuminuria in the others. After the second treatment both yearlings and one aged mare had from 5 to 10mg per 100cc of albumin in their urine. The other aged mare had a slight amount of albuminuria, which could not be measured quantitatively. On the second day after treatment the total number of red cells of all except one had dropped. After treatment the latter mare showed an increase in number of red cells the second day and a decrease the third day from the pretreatment count. Two of the others showed an increase on the third day. In only one animal did the total red cell count go below 7,000,000 per cmm.

A group of five animals, consisting of two large mules, two saddle-bred horses and a standard-bred mare were each given 31¼gm of phenothiazine in suspension with bentonite. On the third day after treatment the fecal egg count was negative for strongyle eggs on four of them. One still had five eggs on the entire slide on the seventh day. One of the horses and the mare were old and not in good condition. The former had 10mg per 100cc of albumin in her urine on the seventh day after treatment. On the seventh day the total red cell count of each had dropped below the pretreatment count, but not below the normal range.

Discussion

The efficacy of phenothiazine as an anthelmintic for strongyles in horses has been confirmed by all who have had experience with it. Although the dose has been decreased from the original recommendations, the amount apparently has not been considered important because of the supposed non-toxicity of the drug. If there is some toxicity, as our results indicate, the dosage becomes more important.

Thirty-gram doses were sufficient in 17 of 20 animals the size of mature thoroughbreds. This amount seems to be near the

minimum efficient dose. Forty-five grams to the largest thoroughbreds, especially if they are heavily infested, would probably result in increased efficiency. In considering the possible ill effects and the efficiency of the drug it would seem advisable to use a dose of 30 grams for animals the size of mature thoroughbreds.

Egg counts were made from the feces of 56 of a group of 109 weanlings each of which had received 15gm of phenothiazine in its feed on December 16, 1940. Five days later 43 of them had a negative egg count; 12 had an average of three eggs and one had eight eggs on the entire slide. Fifteen grams would seem to be a sufficient dose for animals of this size.

There seems to be no reason for fasting an animal except to induce it to eat feed to which phenothiazine has been added. Most, but not all, of the animals in which we found hemoglobinuria, had been fasted for one or more feeds. Because all the animals in which clinical symptoms developed following administration of phenothiazine were found to have decreased peristalsis and constipation, it would probably be advisable to give one or two laxative feeds, as bran mashes, before administering the drug, if there is any tendency toward constipation. Giving mineral oil at the time of administering the drug was of questionable value to the few animals to which we gave it. Dividing the dose into equal parts, which were administered on succeeding days, was efficient in eliminating the strongyles. It did not appear to have any effect on the absorption, as indicated by total red cell count and urine examination. The size of the dose and the frequency of dosing warrants consideration, as does any factor which will decrease absorption. Phenothiazine seems to cause enough irritation in the intestinal tract to produce increased mucus. However, in only one of the animals on which we performed a necropsy was there any acute enteritis. The significant symptoms are the results of absorption from the intestines.

Hemoglobinuria was not found in animals the size of mature thoroughbreds when single 30gm doses of phenothiazine were given. It was produced in one (a two-year-old grade, draft filly) of four immature horses given four monthly 30gm doses. From these cases in which we have examined the urine following the administration of phenothiazine it can be said that hemoglobinuria is not likely to occur following single, minimum effective doses. That the hemoglobinuria is the result of a destruction of erythrocytes within the blood stream is indicated by the icterus seen, by the hemolysis which repeatedly occurred in the citrated blood of two animals which had hemoglobinuria at the time, and by the fact that hemoglobinuria, but not hematuria, was found. However, in microscopic sections of kidneys from animals previously treated with phenothiazine, erythrocytes were found in the glomeruli outside of the capillaries and in the tubules.

Since our previous report[6] we have studied the effect of phenothiazine on the total number of red cells of 39 animals. There was a decrease of more than a million in each of 28. In each of six there was a decrease of less than a million, and in each of five others there was an increase in the total number of red cells following treatment. Of the latter, only one had as much as 45gm of phenothiazine. That phenothiazine does have a tendency to decrease the total number of red cells is shown by the amount of decrease in some instances and the percentage having some decrease.

An aged pregnant mare having received 75gm of phenothiazine two months previously had severe swelling in all four legs and over the ventral surface of her abdomen. It was difficult for her to move. Her urine contained more than 15mg per 100cc of albumin at this time. Finding albuminuria in the yearling that had received one 40gm dose of phenothiazine as a suckling has been mentioned. Previous urine examinations had not been made in these cases, and the albuminuria may or may not have been due to the previous large dose of phenothiazine. Albuminuria was found in pregnant animals following the administration of 30gm of phenothiazine and in a yearling after receiving 15gm. These ani-

mals had received a previous large dose which was being recommended at the time when they were first treated. In other animals that had not previously received phenothiazine, albuminuria was found following the administration of larger doses. One such animal had 40mg per 100cc of albumin in her urine after receiving only 50gm of phenothiazine.

The significance and possible control methods of the anemia and albuminuria following the administration of phenothiazine remain problems. One recommendation that could be made at this time is to use the minimum effective dose. Doses greater than 50gm are probably unnecessary for even the largest horses. The anemia and albuminuria may be of little immediate consequence when smaller doses are given. However, it appears that even the smaller doses cannot be given at monthly intervals without leading to more severe symptoms in some cases. Albuminuria was most often produced in animals that had received a previous dose. These results indicate a slow recovery or some permanent damage. If the anemia and albuminuria following minimum effective doses of phenothiazine are of a slight degree, there is still a question of how soon the same dose can be safely repeated. It would seem that these symptoms have occurred in a sufficient number of the cases which we have observed, to warrant further consideration.

Microscopic sections of the kidneys from two horses have been described. Sections from the kidneys of six other animals, that had previously been treated with phenothiazine, were obtained. In sections from four (all yearlings) of the latter animals the kidneys were apparently normal. One of the four was examined post mortem 24 hours after receiving 30gm of phenothiazine; one, three months after receiving 60gm; one, four months after receiving 64gm, and one, one month after receiving 90gm.

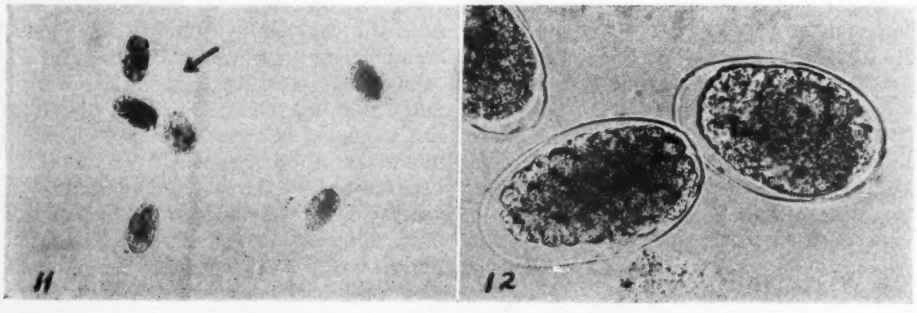
In sections from two of the six animals there was evidence of nephritis. In one, from a yearling which was examined post mortem seven days after receiving 90gm of phenothiazine, there were red cells and albuminous material in the tubules. In the other, from a 19-year-old thoroughbred stallion (condemned because of periodic ophthalmia), on which a necropsy was performed three months after receiving 30gm of phenothiazine, there was moderate degeneration of the epithelium of the convoluted tubules.

Conclusions

1. Phenothiazine should not be classed as a non-toxic equine anthelmintic. Anemia, albuminuria and hemoglobinuria have been found following the administration of phenothiazine to horses in the recommended therapeutic doses.

2. The size and frequency of the dose are involved in the symptoms produced. Age and pregnancy are other factors which appear to deserve consideration.

3. Phenothiazine is very effective in the removal of mature strongyles from horses. The problem is to eliminate the disadvantages of phenothiazine and learn how it, or a chemically related drug, can be used safely and effectively in the control of strongyles.



Eggs of *Strongylus vulgaris*: Left, x100; right, x400.—*Photos by Benbrook*

Recent Materia Medica

IX. Vitamin C and Miscellaneous Factors

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Vitamin C (Ascorbic Acid)

ALTHOUGH ascorbic acid (formerly known as "cevitamic" acid or hexuronic acid), was one of the first of the vitamins to be isolated and synthesized, its story is still only partially written. Many chapters are still missing and, although the functions were once thought to be easily discerned, the feeling today regarding the position of this vitamin is somewhat uncertain. This is perhaps due to the fact that the isolation of other vitamins in recent years has clarified what formerly appeared to present extremely complex problems. In other words, more refined methods of research have revealed that properties ascribed to vitamin C were really characteristic of some other factor. The more one studies vitamin C, the less one is ready to accept past conclusions as to its place in the animal economy. This also leads one to hesitate to be too dogmatic regarding either its uselessness or usefulness in the veterinary field. A belief that it is unnecessary today still holds sway though there is not sufficient experimental work for safe conclusions along such lines.

Though scorbutic conditions were recognized hundreds of years ago, and appear to have been known to the American Indians, the experience of the British navy during the Napoleonic era gave vitamin C an exceptionally fine start. Previous to that time, Cartier, wintering near what is now Quebec, lost 25 of his hundred-odd men, all of whom had contracted the disease. The decoction of spruce needles, suggested by the Indians, saved the rest. Kramer, in 1740, was first to employ orange or lime juice to cure the condition; and soon thereafter (1757) Lind wrote his celebrated treatise on scurvy which he could cure in six days with lemon or orange extract. By 1795, the British naval authorities prescribed citrus fruit in the form of lemon juice for their charges; and from then on the British sailors were nicknamed "limies".

In 1912, Holst and Fröhlich discovered an "anti-scurvy" substance in various foodstuffs; and the investigations by various workers continued until Szent-Györgyi isolated the pure ascorbic acid crystals in 1932. In 1933, Haworth and Hirst; and Reichstein and Gruessner about the same time announced its synthesis.

Vitamin C (ascorbic acid) consists of white or slightly yellow crystals or powder, odorless, having a sour taste, darkening on exposure to light, stable in air when dry, deteriorates when in solution and exposed to air. It is soluble in water and alcohol, insoluble in ether, chloroform, and other fat solvents. It melts at 189 to 192°C. Its solution is acid to litmus paper. It is incompatible with alkalies. Chemically it is $C_6H_8O_6$.

The International Unit for vitamin C is the antiscorbutic activity of 0.05 milligram of standard levo-ascorbic acid, which is the approximate equivalent of 0.1cc lemon juice (25mg equal 500 I.U. or U.S.P. units). Assays are made either chemically (by the dichlorphenol-indophenol titration) or biologically (using scorbutic guinea pigs), noting the degree of protection from hemorrhage or poor tooth structure, etc.

The following undoubtedly require vitamin C as part of their diet, since they are unable to synthesize it: man, monkey, and guinea pig. There is doubt as to the ability of the following animals to synthesize it: cattle, pigs, rabbits, mice. It appears that dogs and rats can synthesize it, but under certain conditions there may be need for supplemental feeding of it. Although vitamin C is called the antiscorbutic vitamin, it has a number of other functions which are important. Although citrus fruits have long been used as its source, it is known that the suprarenal or adrenal gland of cattle and other animals abounds in the vitamin. The liver, intestinal walls, and aqueous humor also contain considerable amounts. Raw milk contains about 10 or 12 units per ounce.

but about half of this is destroyed in pasteurization. Oranges contain about 50mg per 100cc of juice, if fresh. It appears that also be affected. In scorbutic monkeys, those that die usually contract spontaneous acute infections (pneumonia or enterocolitis);

The guinea pig, like man, is unable to synthesize vitamin C. The forlorn-looking cavy on the left is suffering from an acute lack of the antiscorbutic vitamin

goats synthesize their own vitamin C, their diet probably affecting the milk more than the blood content. Birds seem to be able to synthesize the vitamin, large amounts being found in the liver. Silver foxes in captivity seem to require the vitamin.

Frank scurvy — that condition which shows extreme changes in the bones, teeth and gums, vascular and blood elements—is relatively rare in man in this country; but in man as in all susceptible animals, latent scurvy is quite commonly found, even though it is difficult of recognition. Poor dentition or caries, rheumatoid affections, edema of the extremities, spongy or bleeding gums, loose teeth, sallow complexion, petechiae or ecchymoses may be exhibited. Later periosteal hemorrhages of the tibia and femur, epiphyseal separation of the humeral head or knee bones, cardiac dyspnea and great asthenia occur.

The chief role of vitamin C appears to be to maintain the normal cementing substance in the various tissues. Lack of C in teeth is accompanied by production of osteoblasts replacing the odontoblasts and cementoblasts, forming bone in place of dentine and causing fibrous degeneration of the pulp. The intercellular substance and supporting tissue of the blood vessels, and certain blood elements (platelets) also may be involved. The peripheral motor nerves as well as the large anterior horn cells may those surviving show osseous and other signs such as edema and hemorrhagic diatheses. The periosteum separates from the shaft of the long bones, and subperiosteal hemorrhages occur. The ribs show "mushrooming" or "cupping" at the costochondral junctions, and there is evidence of trabecular disintegration.

The positive effects of vitamin C appear to be: (1) Favors normal tooth development. (2) Controls collagen gelation. (3) Serves as defense mechanism against bacterial toxins. (4) Maintains normal endothelium. (5) Essential to glandular functions. (6) Protects vascular system. (7) Is involved in tissue respiration (?). (8) Involved in fracture repair. (9) Hastens wound healing (Lanman and Ingalls found that scorbutic animals' abdominal wounds rupture at a pressure only one-third of that required to rupture wounds of normal animals). Some recent work indicates that ascorbic acid is one of the vitamins deficient in fusospirochetosis or Vincent's disease.

Although the work of Innes has shown that puppies probably do not require the vitamin under ordinary conditions, Marek and Wellmann reported "scorbutus . . . was seen in dogs after continuous feeding of decomposing meat, unbalanced feeding of dog biscuits, cooked cereals plus animal fats, well-cooked milk or meat . . ." The latter authorities also report the condition in

"swine after feeding sterilized milk." The symptoms resemble those found in men, monkeys or guinea-pigs. Recovery is possible through furnishing C-containing supplements. It is quite possible that the ability to synthesize ascorbic acid by dogs, and other animals as well, may be upset by distemper and even by old age. Incidentally, Warren stresses the importance of considering the vitamin-C content of the ration of cattle since "the flavor of milk is greatly influenced, if not controlled" by its inclusion. The use of vitamin C is indicated in small animal practice (both dogs and cats) in conditions such as poor development of dental and osseous structures, gingivitis, indolent fractures, corneal ulcers, and any other conditions in which the cementing material of the connective tissues is weak or lacking, e.g., infantile scurvy.

Some recent work by Phillips *et al.* of the University of Wisconsin, shows that there are times when cattle require additional amounts of vitamin C. For example, the normal physiological function of bulls was restored in 65% to 75% of impotent animals injected subcutaneously with the vitamin. In stubborn cases, 1gm or 2gm per 1000 pounds live weight twice weekly for five to six weeks, or until the bull shows improvement, is the recommended dosage schedule. Phillips has also devised a diagnostic potency test for bulls, in which longevity or viability of the sperms is determined [for details see page 179].

As has already been intimated, the complete story regarding vitamin C has not as yet been written, particularly as it applies to the veterinary field. It remains for future work to reveal which animals suffer conditions associated with a lack of the vitamin.

Vitamin P

It has been observed in man and other animals, that vitamin C by itself is often ineffectual in certain types of hemorrhage. However, it was noted by nutritional workers that lemon juice or other natural citrus fruit extractives relieved or cured conditions of this type. This discovery led to the finding of vitamin P (permeability vitamin) by Szent-Györgyi and several co-workers, in 1936. The material was first obtained from paprika (Hungarian red pepper) and later from lemon juice, hence it is called "citrin." The actual vitamin P is chemically hesperidin, known as a flavone or flavone glucoside.* The continuous daily administration of the concentrated material brought about increased capillary resistance where fragility of the capillary wall or increased permeability formerly existed. The increased survival time of guinea pigs, on a scorbutic diet but receiving vitamin P, has been demonstrated; and at necropsy, fewer hemorrhages were evident. This work by Szent-Györgyi, questioned by Zilva and also by Moll because of their negative findings, has been substantiated by Scarborough and Stewart who found that petechial hemorrhage was reduced by oral administration of hesperidin. Lojas claims that vitamin P has great prophylactic value; and Zacho used citrin from rose hips for treatment of hemorrhagic conditions.

Vitamin P is obtained from lemon juice at the rate of about 2gm for every 70 quarts (70,000cc). Hesperidin is a glucoside present in most citrus fruits as well as in buchu leaves. It is very complex, having the formula: $C_{28}H_{34}O_{15}$. It consists of white, odorless, tasteless crystals which melt at 251 to 252°C. It is practically insoluble in water, ether, chloroform, and benzine; but is soluble in alcohol, alkaline solutions, etc.

In testing the material clinically in humans, Scarborough used patients having abnormally increased capillary fragility associated with dietary deficiency. Using negative pressure (suction) and positive pressure he noted increased resistance in only those cases in which the flavone-containing extracts were employed, either orally, through the rectum, or by intramuscular injections. Györgyi goes as far as to state that lack of vitamin P and lack of vitamin C combine to produce scorbutic conditions, the former causing the hemorrhagic symptoms and the latter the recession of gums from the teeth and swelling of the joints; rapid emaciation and death being due to both. Vitamin P has been employed in man in allergic purpura (children), in nephritic hemorrhage

* Since the original work of Szent-Györgyi, Bruckner and Szent-Györgyi have shown that "citrin" is a mixture of hesperidin and eriodictyol glucoside. Unripe oranges contain more hesperidin and less of the other constituent.

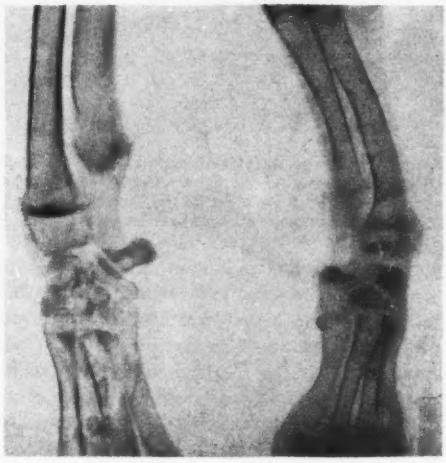
(hematuria), in Schönlein-Henoch purpura, and in acute purpura hemorrhagica.

Vitamin H

Vitamin H has been mentioned already in the tabular presentation of possible B-complex factors, but it is not certain at present just where it should be classed; in fact, its existence is not altogether established. It appears to be an acidic substance obtained from liver, yeast, and kidney. This amino-acid derivative is soluble in water and alcohol and insoluble in fat solvents. Its deficiency in rats causes seborrheic dermatitis (status seborrhoicus), psoriasis, and allergic eczema. It is very closely related to, and may be identical with, "biotin" and "coenzyme R," for all are dializable, heat stable, and resistant to treatment with acids and alkalies. When rats are fed dried, undenatured egg-white, weight loss and striking symptoms of dermatitis, baldness, spastic gait, and death eventually ensue. When fresh egg-white is substituted in a similar group of animals, development and growth are normal. This original study was made by Boas in 1927. The dried-egg-white effect could be counteracted not only by fresh egg-white, but also by yeast, spinach, milk, cabbage, and bananas. Paul György termed the factor vitamin H, showing it could be made available by previously treating the substance containing it with papain. György has worked out a provisional rat unit: namely, the minimum daily dose (administered subcutaneously) that will cure the dermatitis symptoms within four weeks. The tentative dosage schedule is 50 units per kg of body weight. Liver and kidney contain about 10 units (two oral units); hence about 500gm of fresh substance would be required to replace concentrates. Von Kibed has obtained favorable results in human seborrhea. According to the latest work of György and Rose, egg-white injury can be cured by vitamin H obtained by autolysis of yeast extracted with toluene, and from liver by proteolytic digestion or hydrolysis at high pressure. The parenteral route appears to be from three to five times more effective than the oral route. McCay, Bing and Dilley report finding a thermolabile form of vitamin H that is destroyed also by drying. They report that it promotes the growth of young trout.

Vitamin L_1 and L_2

In 1938, Nakahara and Inukai reported the discovery of two factors, not hitherto recognized, which were necessary for lactation



DIFFERENTIATION OF THE BONE LESIONS OF SCURVY AND RICKETS IN DOGS

Left: foreleg of a dog, four months of age, affected with scurvy (Barlöw's disease). Note the distinct, opaque line at the distal epiphysis of the radius indicating perfect ossification, together with a pronounced rarefaction of the ulna, all different from the lesions of rickets

Right: foreleg of a dog, five months of age, affected with rickets. Note the enlargement of the radio-ulnar epiphyses characteristic of rickets

or reproduction in young rats. Factor L_1 (necessary for reproduction) was found in beef liver freed of B-complex factors; and factor L_2 (necessary for lactation) was present in baker's yeast freed of B-complex factors. Attempts have been made to demonstrate the identity of these factors of the L-complex with factor W (Sure's factor), or the "liver filtrate factor" of Morgan and Simms, but there seems to be some difference in the experimental findings, thus far reported. Neither factor is available in highly purified form.

Vitamin M

Whether this vitamin exists as a separate entity is quite doubtful, since it appears to be an intimate part of the B-complex. It

Because monkeys developed a pellagrous condition on a diet containing all known vitamins, the existence of another component of the B-complex (designated vitamin M) has been suspected

cures the pellagrous symptoms found in monkeys. These animals, when presumably fed an adequate diet containing all known vitamins, including nicotinic acid, riboflavin, and thiamin, still developed the condition, which was cured by liver extract or dried yeast. The name vitamin M was temporarily assigned, Day, Langston, and Darby at Arkansas having done the original work on monkeys, in 1939.

"Vitamin F"

Although the term is still found in the literature, vitamin F is not recognized in this country, for it has been used to designate a group of unsaturated fatty acids, including linoleic and linolinic acids, which do promote growth, but are probably no different than other nutritive vegetable or animal fats of the unsaturated series. The term "F" has been officially dropped from vitamin nomenclature in America, since its use is unwarranted.

"Grass Juice Factor"

Elvehjem, Hart, and numerous others such as Kohler, Randle and Wagner, have found an acetone extract of young cereal grasses to be vital to the growth and reproduction of rats or guinea pigs and rabbits. The factor has not been completely identified. Hogan and Johnson have worked along similar lines.

"Chick Anemia Factor"

Hogan and Parrott have reported recently some principle in liver extracted in water, which prevents macrocytic anemia in chicks. Without this factor, all chicks suffering with the disease are reported to die.

"Factor U"

Stokstad and Manning have reported a factor found in yeast and wheat middlings which regulates growth in rats. The same workers reported a "rice factor" which supported normal growth. This factor, together with cartilage, supported growth of chickens. Others have found a "cartilage growth factor."

"Factors R and S"

These factors of growth and reproduction, part of the B-complex, affect egg production, hatchability, and weight and growth of chicks. The original work was done at Cornell.

Summary

The field of vitamin therapy is in a state of flux, and even while this is being written reports undoubtedly are being prepared which must modify many of the statements that have been made by the present writer. New discoveries will open up new avenues of opportunity in this most fascinating field. The discovery and synthesis of one vitamin factor usually paves the way for the recognition of a new vitamin—at least, that has thus far been the rule. Not only are new vitamins going to be discovered, or old "complexes" broken down into their several fractions, but new uses for the older members of this evergrowing family will prove their indispensible character. And even now, biochemists are devising *substitutes* for several of the vitamins, as for example vitamin K_1. The future of vitamin therapy must indeed be viewed with pleasant anticipation for the rich stores of surprising knowledge that lie ahead!

This concludes a series of nine articles by Professor Lewitus on vitamins. A new series by the same author, dealing with the various hormones or endocrine products now available, will begin in April.

Bovine Coccidiosis Treated with Sulfanilamide

By RAYMOND McPEEK and FERNANDO E. ARMSTRONG
Manhattan, Kansas
Kansas State College, Class of 1941

HEMORRHAGIC coccidiosis (red dysentery) of cattle is an enzootic disease caused by the protozoon *Eimeria zürni*. This protozoon attacks the mucous membranes of the rectum and small intestine, causing a hemorrhagic diarrhea which in severe cases may result in exhaustion and death.

The disease is common in the cold, wet winter months, since lowered resistance of the animal is of primary importance in the development of the condition.

Etiology and Pathogenesis

The oval oocysts of *Eimeria zürni* are passed in the feces of infected animals. Under favorable conditions of temperature and moisture, they develop into four sporoblasts, each containing two sporozoites. The infective stage of the sporozoites is reached in from two to seven days. After ingestion of the infective oocyst and its passage to the small intestine, its wall is dissolved, and the liberated sporozoites enter the cells of the intestinal epithelium. Here they undergo changes leading to the formation of schizonts. The schizont gives rise to a number of merozoites, which destroy the epithelial cell and enter new and healthy cells. The process of schizogony is repeated a number of times. Eventually the life cycle enters the sexual phase, the male and female uniting to form a zygote which becomes an oocyst ready to pass out with the feces.

It is the penetration and destruction of the lining epithelial cells and glandular epithelial cells by the merozoites that produce the symptoms of the disease. This destruction exposes the underlying capillaries, and hemorrhage occurs.

Infection usually occurs under insanitary conditions when animals are in contact with one another and eating from the ground or from mangers close to the ground. Contaminated water and feed carry infective oocysts to healthy animals. A muddy lot makes a good incubator for infected feces, and under the influence of proper moisture and temperature it will remain infective for two or three months.

A calf may remain infected, as shown by positive fecal examinations, over a long period of time without showing any symptoms; a sudden lowering of the resistance, such as that caused by exposure to cold, damp weather, will bring on an active stage of the disease. On the other hand, the active disease may appear as soon as the animal has ingested enough contaminated material; a previously uninfected calf placed on an infected lot may develop the symptoms in a few days.

Young calves are more susceptible to the disease than older cattle. However, animals over two years of age may be infected under conditions of poor sanitation.

Clinical Record

The herdsman of a large dairy herd noticed that a small, somewhat emaciated Jersey calf (No. 435A) was passing watery, hemorrhagic feces. He immediately summoned veterinary aid. On examination the pulse and temperature were found to be normal. The perineal region was covered with mucohemorrhagic fecal material. A fecal sample was obtained by digital manipulation of the rectum and examined by the sugar flotation method. Using the Stoll technique, the count was 22,000 oocysts per gram of feces.

Treatment with sulfanilamide was suggested by the results obtained by Drs. G. R. Moore of the Department of Surgery and Medicine and W. W. Thompson of the Department of Pathology, Kansas State College, in the treatment of coccidiosis in dogs. The procedure was carried out under the supervision of Dr. S. J. Roberts of the Department of Surgery and Medicine.

This calf was one of 11 kept together on the same ground and in the same pen. It was decided to take fecal samples from the

others every two days for the purpose of observing the progress, if any, of the disease through the group. Animals showing symptoms of the disease were segregated.

The lot in which the calves were kept and

The lot into which the calves were turned, and on which the hayrack was located, was muddy and piled deep with feces

the pen opening onto the lot measured 40 feet by 40 feet and 10 feet by 12 feet, respectively. The soil of the lot was loose and muddy, and badly contaminated with feces.

No change was made in the routine care of the animals. The pens were cleaned daily, and on fair days the calves were turned out in the lot. The calves were fed from a trough on the floor of the pen and also had access to a hayrack in the lot.

Calf No. 435A was treated on the appearance of symptoms with ½ oz. tannic acid and ½ oz. salicylic acid twice a day per os. A 2% alum enema was given once a day. This treatment was continued for three days, and symptoms were absent on the second. However, the calf continued to show a high positive fecal count, and sulfanilamide was given. The fecal sample taken on the fourth day following the administration of sulfanilamide was negative.

The fecal examinations of calf No. 440A were positive although the animal did not exhibit symptoms. It was decided to try sulfanilamide in this case also. The fecal sample taken on the second day after the administration of sulfanilamide was positive, but the sample on the fourth day was negative.

Calves Nos. 219, 196, 341A, and 223A remained negative throughout the observation period, although they were on infected ground with the others.

The fecal counts of calves Nos. 438A and 222A were consistently low. At no time were symptoms present. They were not treated, and they remained positive.

The day after the first administration of sulfanilamide (two doses of 5.5gm each) calf No. 342A went down with severe tympany of the rumen. Sulfanilamide was immediately suspended and the calf was given ¼ lb. of magnesium sulphate in one gallon of water with two drams of formalin. The blood had disappeared from the feces, but they remained positive for oocysts. Sulfanilamide was therefore resumed on the fifth day, and the fecal sample taken four days later was negative for oocysts. It appears that the level of the concentration of sulfanilamide was not maintained long enough at the first administration to produce a negative fecal examination.

Other Cases

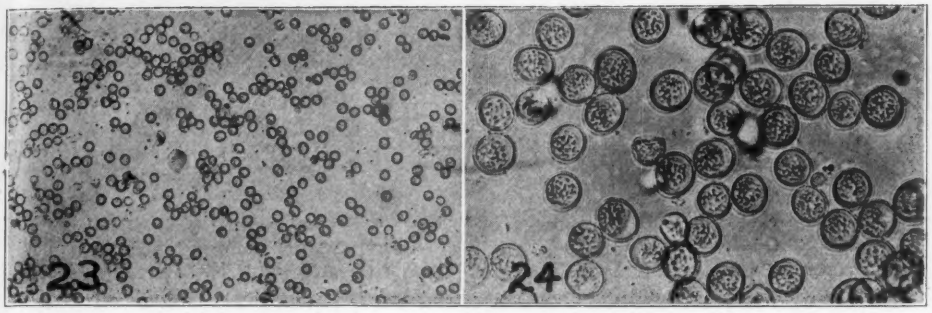
While the above observations were being carried on, another owner brought a sample of feces to the clinic. Nine of his calves had shown a hemorrhagic diarrhea about two weeks before and all had recovered but two which were in a rundown condition and continued to pass bloody feces. A fecal ex-

TABLE I.

Calf No.	Breed	Weight	Oocysts per Gm feces	Days									
				1st	3rd	5th	7th	9th	11th	13th	15th	17th	19th
435A	J	260	22,600	S P	P	P	P	P	P	T P	P	N	N
439A	J	275	12,000	P	S P	T P	P	P	N	N	N	N	N
440A	H	350	4,200	P	P	P	T P	P	N	N	N	N	N
338A	H	320	7,600	N	N	P	T P S	P	N	N	N	N	N
219	G	285	.....	N	N	N	N	N	N	N	N	N	N
196	A	240	.....	N	N	N	N	N	N	N	N	N	N
438A	A	300	1,700	P	P	P	P	P	P	P	P	P	P
222A	G	310	2,900	P	P	P	N	P	P	P	P	P	P
342A	G	320	28,500	N	N	N	T P S	P	T P	P	N	N	N
341A	H	350	.....	N	N	N	N	N	N	N	N	N	N
223A	G	270	.....	N	N	N	N	N	N	N	N	N	N

P=Positive. N=Negative. S=First appearance of symptoms. T=Treatment with sulfanilamide begun.

amination disclosed 87,000 oocysts per gram of feces. Sulfanilamide was dispensed for treatment. Three days later the owner reported that one calf had died after the first dose of sulfanilamide, but that the other was now passing normal feces. No fecal check was made.



Oocysts of *Eimeria zürni*: left, x100; right, x400.—*Photos by Biester*

A seven-year-old Jersey cow weighing 750 lbs. was presented at the clinic with a hemorrhagic diarrhea of long duration. The pulse and temperature were normal. A sugar flotation test was positive for coccidiosis. Sulfanilamide was given, and the feces became negative on the fourth day, their consistency having returned to normal the day before.

Method of Administration

The sulfanilamide was given in powder form. The dosage in all cases treated was one gram per 20 lbs. of body weight per day. It was divided into two doses, administered morning and evening in gelatine capsules with the aid of a balling gun. The object was to keep the concentration of sulfanilamide in the body at a high level for three or four days; if the feces had continued positive, the treatment would have been continued a few days longer. However, since the feces were invariably negative by the morning of the fifth consecutive day of treatment, the sulfanilamide was in no case continued longer than this.

Discussion

Because of the small number of animals, these encouraging results do not fully establish the value of sulfanilamide therapy in coccidiosis of cattle. In any case, it would need to be carefully supervised if used in general practice, since it requires rigid application, necessitating several days of careful cooperation on the part of the herdsman or farmer, and since there is always the possibility of an unfavorable reaction to the drug.

It might be noted that in the animals observed, the appearance of clinical symptoms was invariably accompanied by a fecal count of over 5,000 oocysts per gram, using the Stoll technique. The counts varied from 1,700 to 87,000. The calves with a count of less than 5,000 showed no symptoms of the disease. The animal with a count of 87,000 had been exhibiting a hemorrhagic diarrhea for at least two weeks, and the fecal sample contained visible clots of blood.

Conclusions

In a limited number of cases, sulfanilamide had a marked effect upon *Eimeria zürni* infection of calves, the oocysts disappearing from the feces of animals with both clinical and subclinical infections after three or four days of sulfanilamide therapy. To be effective, it was necessary to maintain the sulfanilamide constantly in the body during that period.

Further experimentation along this line may show that sulfanilamide, administered under careful veterinary supervision, may be of value as a control measure for bovine coccidiosis.

Rickets in Silver Fox Pups[1]

By G. L. OTT,[2] Thiensville, Wisconsin

and

A. I. COOMBES[3]
Madison, Wisconsin

HANSON[4] reported in 1935 that rickets is rare in silver foxes in the wild, but fairly common among animals in captivity. At present, cases of rickets on ranches occur rarely, if at all. Undoubtedly this is due to improvements in rations through a better knowledge of nutritional requirements, better housing conditions, which permit access to adequate sunlight, especially during the late spring and early summer, and the use of such concentrates as cod-liver oil and irradiated yeast, which supply ample amounts of vitamin D, judging by the requirements of other domestic animals.

Since foxes usually have a sufficient supply of vitamin D from sunlight and from concentrates, the problem of rickets due to a lack of vitamin D is of no great significance to the average fox farmer. However, because of the fairly common practice of fortifying the ration by the addition of minerals, ill-chosen mineral supplements may produce an improper calcium-phosphorus ratio in the diet.

It was planned in this experiment to seriously disturb the calcium-phosphorus ratio in the diet in order to determine if rachitic foxes could be produced by an improper balance of these two elements in a ration low in vitamin D but otherwise adequate, and how long it would take.

Experimental Procedure

A fox ration used for several years, during which time cases of rickets have not been observed, formed the basis for this investigation. The experimental ration was prepared as follows:

Horse muscle meat	45.00%
Intestines, etc.	5.00%
Raw carrots	5.00%
Fish meal	3.25%
Kelp meal	1.75%
Dried bread	10.00%
Dried corn flakes	5.00%
Blood	8.00%
Liquid skim milk	8.50%
Dried figs	1.25%
Water	7.25%

Normally, cod-liver oil and liver are added to this ration. For this experiment, these two ingredients were omitted, primarily because cod-liver oil may compensate to some extent for an improper calcium-phosphorus balance. The experimental ration, therefore, can be regarded as containing little or no vitamin D although it was not biologically assayed for this vitamin.

By chemical analysis, the calcium-phosphorus ratio of this diet was found to be 1.32 to 1, which is within the normal range of ratios found in fox feeds now generally used.

Two groups of animals, selected from one litter born April 9, 1940, were employed in this trial. They were maintained in individual rectangular wire pens (4 ft. x 6 ft. x 2½ ft.) raised about two feet from the ground. The pens were provided with some shade (lath racks over one-half of the pen) and a small kennel containing no nesting material. The animals had access to water at all times, and were fed once daily in the

[1] Published with the approval of the Director of the Wisconsin Agricultural Experiment Station. The authors wish to express sincere appreciation to Mr. R. G. Stephenson of the Nieman-Stephenson Co., of Cedarburg, Wisconsin and to Dr. W. Wisnicky, Director of the Fur Research Program of the University of Wisconsin, for their cooperation and valuable suggestions in the conduct of this experiment; and to Mr. E. H. Spitzer for the blood analyses reported herein.

[2] Herbert A. Nieman and Co.

[3] Department of Biochemistry, College of Agriculture, University of Wisconsin.

[4] Hanson, K. B., 1935. *American Fur Breeder*, July.

late afternoon. The total food consumption of each animal was recorded daily.

Group I, consisting of two fox pups (Nos. 60131 T40 and 60132 T40) received the above basal ration plus sufficient calcium supplied as calcium carbonate to establish a calcium-phosphorus ratio of 7 to 1. This level of calcium carbonate was selected because a higher one made the ration unpalatable for the pups, as shown in preliminary trials.

TABLE I.

Ration and Animal	Feed Consumed (kilograms)	Body Weights (kilograms) 5-21-40	6-15-40	7-29-40
High calcium				
60131 T40	17.56	1.03	1.94	3.02
60132 T40	16.57	0.94	1.71	2.79
High calcium & High phosphorus				
60133 T40	21.10	1.03	1.88	3.08
60134 T40	23.15	0.97	1.77	3.19
Regular ration Average of four controls	25.12	1.11	.....	3.25

Group II, consisting of two fox pups from the same litter (Nos. 60133 T40 and 60134 T40), received the basal diet and the same added amount of calcium carbonate as Group I, with the further addition of phosphorus as secondary potassium phosphate (K_2HPO_4) in amounts sufficient to re-establish the normal calcium-phosphorus ratio of 1.32 to 1, yet have approximately seven times the normal amounts of each of these elements present.

A third group of four foxes of the same age, maintained under identical management conditions on the regular ranch diet, served as controls.

The feeding trial was started on May 21, 1940, when the pups were six weeks old, and discontinued on July 29, 1940, approximately ten days after the development of rickets was definitely established in Group I. At this time, all of the animals were restored to the regular ranch ration (the basal ration plus cod-liver oil and liver) to permit normal calcification. Photographs of the front leg deformities were made when the experimental rations were discontinued.

TABLE II.

Ration and Animal	Serum Calcium (mg %) 8-9-40	11-11-40	Inorganic Phosphorus (mg %) 8-9-40	11-11-40
High calcium				
60131 T40	10.4	9.40	9.13	6.05
60132 T40	.....	9.37	.....	6.10
High calcium & High phosphorus				
60133 T40	9.60	8.50	8.54	7.80
60134 T40	9.45	8.83	8.07	7.62
Average normal values	.....	9.00	.....	6.00

The animals were weighed at approximately monthly intervals. Blood samples were not collected from these animals during the course of the experiment, but such collections were made for serum calcium and inorganic phosphorus determinations on August 9, 1940, 11 days after the animals had been placed back on the regular ranch feed. Further blood samples were obtained when the animals were pelted on November 11, 1940. The bones of the forelegs from the foxes in both groups and from the control animals were preserved and representatives of each group were analyzed for their total ash content. Photographs of the foreleg bones were also taken for comparison with those of normal foxes at this time.

Results

Total food consumptions (in kilograms) and the weights of the animals (in kilograms) in the experimental groups during the test period are presented in Table I.

There was no general weakness or nervous involvement shown in any of these animals. Definite rachitic symptoms, as evidenced by enlargement of the joints of the front legs, which became thickened and crooked,

were observed in both animals receiving the diet high in calcium alone (Group I), but not in those consuming the diet high in

Figure 1

both calcium and phosphorus (Group II) nor in the controls. This is clearly illustrated in Figures 1 and 2. The former shows

TABLE III.

Ration and Animal	Total Bone Ash (per cent)
High calcium	
60131 T40	58.91
60132 T40	58.97
High calcium and High phosphorus	
60133 T40	59.02
60134 T40	58.88
Regular ration	
Average of four controls	59.14

the leg deformities in one of the rachitic foxes from Group I and the latter shows a foreleg bone from one animal in each of the experimental groups as well as from one of the control animals on regular feed.

The analyses of the blood samples for serum calcium and inorganic phosphorus are indicated in Table II. The figures for these two elements in normal fox blood are also given; these are based on a large number of such analyses from foxes from several different ranches, including the control animals used in this experiment.[5]

The analyses of the foreleg bones for their total ash content are shown in Table III. To determine whether or not normal calcification occurred after the animals were returned to the regular ranch diet, these

Figure 2
Left: No. 60134 (Group II). Center: No. 60132 (Group I). Right: No. 19754 (Control)

ash analyses were made approximately three and one-half months after the experimental rations had been discontinued.

Discussion

It has been observed[1] that "in foxes, the symptoms of rickets are limited chiefly to deformities of the bones. Occasionally weakness and nervous symptoms such as paralysis, spasms and even convulsions are encountered. As a general rule, the evidences of this disease in foxes are manifested more in the bones of the forelegs than anywhere else in the body. In the affected pups, the front legs become enlarged at the joints, thickened and crooked. As a result of their bowed condition, they appear considerably shorter than normal."

When the calcium and phosphorus were

[5] Coombes, A. I., E. H. Spitzer, and W. Wisnicky. In press.

in imbalance, (Group I), this condition definitely was established in our animals after feeding the unbalanced ration for approximately two months. There were definite rachitic symptoms, particularly noticeable in the forelegs. These were thickened and bowed and much enlarged, especially at the ankle joint. The forelegs were about one-fourth shorter than those of the pups in Group II. The sterno-costal joints were also enlarged to some extent. No general symptoms of nervousness or weakness were apparent while the animals were on the experimental rations.

Rickets did not occur in the animals in Group II, which were receiving the vitamin D-low basal ration supplemented with seven times the normal amounts of both calcium and phosphorus. Since the basal ration contained little or no vitamin D from any of the food ingredients, it appeared that exposure to sunlight provided enough vitamin D to prevent rickets in Group II over the experimental period and during the critical growing stage, but not enough to prevent rickets in the animals in Group I, receiving the ration with the seriously disturbed calcium-phosphorus ratio.

Food consumption and growth gains of all the animals on the experimental feeds were normal, showing no variation of any significance.

Blood analyses 11 days after restoration to the regular ranch diet showed that the serum calcium-inorganic phosphorus ratios were approximately normal, and there was no appreciable change after another period of approximately 90 days.

The percentage of bone ash of all the animals on the experimental diets was approximately the same, showing no variation from the normal. This would tend to indicate that after the rachitic symptoms had been definitely established, restoration of the animals to the regular ranch diet permitted normal calcification to occur.

Summary

1. The experimental production of rickets in silver fox pups is described, along with some data on the symptoms observed, the chemical analyses of the blood for serum calcium and inorganic phosphorus content, and the total ash content of the bones.

2. Foxes receiving a vitamin D-low basal ration supplemented with calcium carbonate in amounts sufficient to create a calcium-phosphorus ratio in their diet of 7 to 1, clearly showed rachitic symptoms.

3. Foxes receiving the same vitamin D-low basal ration supplemented with calcium carbonate and secondary potassium phosphate in amounts sufficient to have seven times the normal dietary content of these two elements present, yet in the same ratio to one another as in the basal diet (1.32 to 1), showed no rachitic symptoms and appeared normal in every respect.

Pelts in the Fur House of Nieman Ranches

Swine Practice*

By E. R. TRUAX, Sac City, Iowa

A VERY large part of the work of a practitioner in the Corn Belt is concerned with swine practice and its problems, from the time the sows are bred until their litters go to market. The practitioner owes it to his clients to improve his knowledge by keeping in touch with the latest developments in disease research, nutrition, and parasitism, for all are becoming more important in successful swine raising. If we are to be of the most assistance to the hog raiser, a knowledge of feeds, vitamins, and mineral elements is as much a necessity to the veterinarian as a knowledge of disease.

In this paper, I shall attempt to cover only certain phases of some common conditions encountered as a general practitioner and some observations in my own practice and those of my colleagues.

Care of Brood Sows

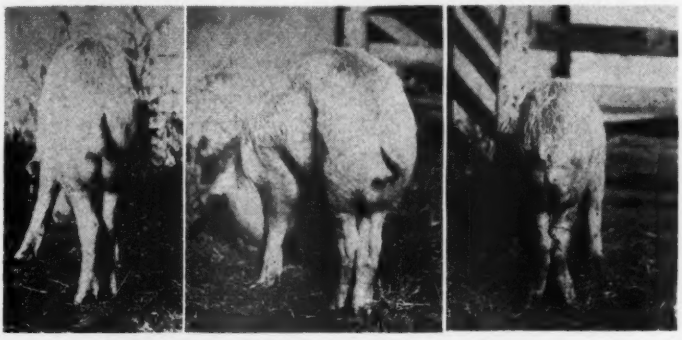
The first requisite for a good pig crop is careful selection of the correct type and kind of breeding stock. The next step is correct ration for the sow. This should begin even before she is bred, if she is to raise healthy, vigorous litters and remain vigorous herself.

A great many swine raisers need the advice of their veterinarians on the proper rations for their hogs. In my territory in recent years, some improvement has been made so far as protein requirements are concerned. However, there is room for further improvement in the quality and quantity of protein, when the hog price is low. Vitamin and mineral elements are often lacking, although they can be supplied reasonably. Failure to feed legume hay when hogs are not on pasture is a very common error. These deficiencies often become evident early in the nursing period.

Feeding experiments (Doyle, Indiana Experiment Station) indicate that the ration of the sow during the gestation period has considerable influence on the death rate in new-born pigs. When sows were fed good quality protein throughout the gestation period, the average death loss was 11%.

* Presented at the 59th Annual Meeting of the Illinois V. M. A., January 23-24, 1941.

When only grain and minerals were fed, the death loss was 44% during the first week. Improper housing and feeding of the sow after the pigs are farrowed account for further losses. The 33% additional loss of young pigs when the sows were given an inadequate ration might very well represent the difference between success and failure in the swine breeding operation.



Three of a group of experimental pigs, showing the effects of nutritional deficiency

Pig Scour

The sow's ration should be reduced a day or two before farrowing and for a week to ten days afterward. The amount of feed should be increased gradually after farrowing, as heavy feeding increases the incidence of pig scour. Wet weather and damp, insanitary quarters are other productive causes of this ailment.

When pig scour appears in a litter, reduce the sow's ration and add sodium bicarbonate to the feed or drinking water. This will check mild cases due to dietary errors. Copper and iron sulphate in the slop or feed for a few feeds is of distinct benefit. Dissolve one-half pound of copper sulphate, or four ounces each of copper and iron sulphate, in a gallon of water with caramel to color, mixing one pint of this stock solution in 20 gallons of slop, or one-half ounce per sow. This is a profitable medicament to dispense. Formalin also is generally effective in two- to four-dram doses. It is best administered in the slop. In severe cases, due to the colon typhoid group of organisms, enteritis mixed bacterin is indicated and effective.

Pig Anemia

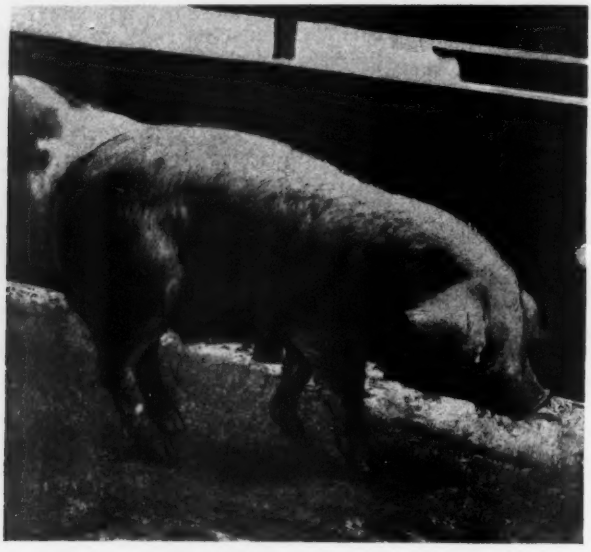
Anemia is responsible for a heavy loss in baby pigs. This is especially true of pigs farrowed early in the season, during February and March, or later when the weather is bad and the pens are muddy, compelling the owner to keep them up on floors or inside away from soil and sunlight. It may occur also in pigs that have access to soil, and in pigs raised according to the McLean County System, as some soils are deficient in the necessary copper and iron. The element cobalt, which appears necessary for iron utilization, may be lacking also.

All are familiar with the characteristic edema, thumps, pneumonia, and heavy death loss encountered in severe anemia in pigs. A Tallquist hemoglobinometer is of real value in making a diagnosis in anemia. It should be part of the equipment of every veterinarian.

To prevent anemia in baby pigs, add copper and iron sulphate to clean black dirt and place a small quantity in the pens daily from the day the pigs are farrowed till they are removed to pasture. We can render our clients a real service by inducing them to carry out this simple procedure. Painting the sow's teats with a solution of iron and copper sulphate in molasses is mussy, insanitary, and requires an undue amount of time. In very anemic herds, I have had best results from individual dosing of the pigs with reduced iron; about five grains daily for four or five days.

Hog Cholera

A large part of a veterinarian's swine practice consists of immunizing hogs against hog cholera. There has been considerable discussion as to the proper age for immunization. The past four years, the trend has been toward vaccination at an earlier age. Personally, I prefer to vaccinate pigs at from five to eight weeks of age, and try to avoid vaccinating any under four weeks. When conditions arise that make it necessary to do so, the owner should be informed that they may not acquire a permanent immunity, and that they should be marked for identification and either sent to market at an early age or, if they are to be kept for breeding stock, revaccinated at six months of age. I always increase the dose of virus for very young pigs to 4cc or 5cc. Regardless of the age at which swine are vaccinated, we should attempt to be sure that the herd is in condition for immunization. Failure to examine the herd carefully before starting to vaccinate may result in serious trouble later. Question the owner as to their condition, but do not rely entirely on his statements, for some owners are not very observing. During the busy vaccinating season, in our haste to take care of all the clients that want their hogs immunized (nearly always early in the morning), we are likely to grow careless in examining herds and vaccinate pigs that are in no condition to stand it. Some of the commoner contraindications for vaccination are: pig anemia, latent infections, pulmonary complications, enteritis, pox and parasites. It is far better to leave the animals unvaccinated than to run into trouble through haste and carelessness a few days later. It does not pay either the veterinarian or the owner to vaccinate unthrifty pigs, and there is nothing that will get a veterinarian into more trouble, except using low serum dosage. Wherever it is practical, each herd should be inspected a day or two before vaccination is contemplated, and observed carefully again on the day of treatment.



An animal in the advanced stage of acute hog cholera

If veterinarians are to do an increased proportion of the immunization of swine, our results must be superior to those of the farmer who vaccinates his own animals. This can be accomplished only by careful examination of the herd for acute and latent infections, faulty diets, parasitism, etc., before starting treatment, and not vaccinating until these conditions are corrected. Then give ample doses of serum. I always

give more serum than the dosage indicated on the label. I try to induce the owner to agree to about 1cc per pound for pigs weighing 35 to 40 pounds. Few clients object to an increased dose of serum if the reasons are properly explained. The frequency of severe reactions in what appear to be healthy herds demonstrates the necessity for liberal serum dosage.

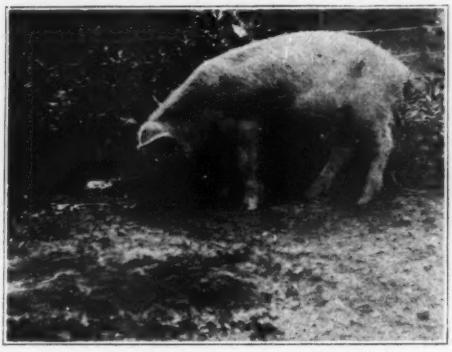
Virus is an unstable product. It requires protection against heat and light, especially direct sunlight, when working in the field. A portable refrigerator should be a part of every veterinarian's vaccinating equipment. The virus is the product that produces the long-lasting immunity. Never give less than the dose indicated on the label.

When trouble develops in a herd the first two weeks following vaccination, the trouble is not with the serum if plenty of it was given. It is due to some other cause. Personally, I have never seen a serum break. The trouble in most of these herds, in my experience, has been due to yard infections, including the various forms of enteritis, pulmonary infections, parasites, etc. These intestinal and lung infections often become septicemic and are difficult to distinguish from hog cholera. A laboratory examination is a valuable aid to diagnosis.

When vaccinating herds already sick with hog cholera, the owner should be warned of a loss and informed it is useless to vaccinate hogs with visible symptoms of cholera, as the double treatment is primarily preventive and not curative. It requires a great deal of time to take the temperature of each hog to determine how many are sick. Satisfactory results are usually obtained by calling the hogs out for feeding. All that will come out of the bed, eat, and remain out eating grain for 10 to 15 minutes, are usually good risks for vaccination. This method saves a busy practitioner considerable time. The serum dosage in herds sick with hog cholera should be increased 50% to 100%. I always use virus in sick herds. In my experience the results have been better when virus was used. The client is saved the cost of revaccinating the herd later, which is necessary if serum alone is used. In infected animals the small amount of virus given is unimportant; in uninfected animals it is necessary.

Enteritis

The various forms of intestinal ailments in hogs cause more trouble than any other disease. The death loss from enteritis is exceeded, if at all, only by that of hog cholera. The economic loss from enteritis is much greater than from hog cholera.



Infectious necrotic enteritis

The types of enteritis of swine most often encountered by the swine practitioner are what have been called necrotic enteritis, swine typhus, "necro," etc., and hemorrhagic dysentery or bloody diarrhea. The two types of enteritis, necrotic enteritis and hemorrhagic dysentery, differ markedly in their clinical symptoms, which are familiar to all veterinarians. Formerly these diseases were regarded as being of bacterial origin and associated with insanitary conditions. Davis, Freeman and Madison, of the Michigan Agricultural Experiment Station, report six experiments which indicate that necrotic enteritis of swine develops primarily as the result of a nutritional deficiency. Their conclusion is that infectious necrotic enteritis is a secondary complication caused by the invasion of the intestinal tract by *Salmonella cholerasuis* and other organisms. They fed liver, yeast and particularly nicotinic acid, with remarkable results. This may explain the development of necrotic enteritis in pigs on some farms under the McLean County plan.

I have used the nicotinic acid treatment on a few herds with the following results in two of them:

Herd No. 1.—There were 76 pigs in this herd. They weighed about 56 pounds. They

were fall pigs in a dry yard on a ration of shelled corn, mineralized tankage and salt in self-feeders. Their hair coats were rough, many were emaciated, and they showed a marked dermatitis, especially over the shoulders, neck, and ears. Four pigs were already dead. A necropsy was held on two of these. The intestinal tract showed the usual lesions of necrotic enteritis.

Two pigs died the second day of treatment. At the end of a week, two more were killed because they looked as though they would be unprofitable to keep. The remaining 66 made a marked improvement. Scouring ceased in about six days. Recovery was complete at the end of the treatment period.

Herd No. 2.—In May, 1940, I was called to see a herd of 80 feeder pigs weighing about 100 pounds. These were test pigs purchased from a serum company about three weeks previously. They were put in the feed yard following feeder cattle upon their arrival on the farm. No other hogs had been on the farm for four months. Four days before my visit the owner had removed 22 that were scouring from the feed lot and placed them on ground barley slop with alkaline solution. Two had died a day or so before I called. These pigs were passing liquid feces streaked with blood. A diagnosis of hemorrhagic dysentery was made.

The 54 apparently normal pigs, which also had been started on alkaline solution at the same time the sick ones were started on it, were taken from the feed lot to a clean field on high ground and placed in a movable yard, which was moved to clean ground every few days. They were divided into two lots of 27 pigs each. One lot continued to receive alkaline treatment. The pigs in the other lot were given 100mg each of nicotinic acid daily. One from each group developed enteritis with scour in a few days, and were removed to the sick group that had been divided into two lots of 11 each, in movable pens on clean ground. One group of the sick pigs was continued on the alkaline solution, the other group was given 100mg each daily of nicotinic acid.

One pig in each sick lot died. The remainder recovered and were fed out. No conclusions can be drawn from the result in this herd, as all the animals received alkaline solution before half of them were given nicotinic acid.

Phosphorus deficiency in a boar

The group that received nicotinic acid apparently did no better than the other group.

Swine Dysentery

In my section of the country hemorrhagic dysentery appears to be on the increase. During the past year the majority of cases of enteritis that I have been called upon to treat has been of this type. Dysentery affects swine of all ages. The young pigs seem to possess less resistance to it than older hog, although I have observed herds in which the disease killed sows in two or three days. The mortality depends on the virulence of the infection and the animals' resistance. Dysentery seems to spread from animal to animal through contamination of feed by infected hogs. The causative factor is present in the feces of affected animals. It does not spread to other farms except through the transfer of infected hogs. The period of incubation in the field cases appears to be about one week.

In acute dysentery of swine often the first evidence of any trouble in a herd is when

Sanitation is important in swine husbandry. The insanitary conditions which produced this case of tetanus are obvious

A common condition observed on many farms. The swine covered with mud indicate a hog wallow is maintained on the premises. The small pig on the extreme left is a runt. Runts are due, usually, to parasites. Hog wallows, ascarids and runty pigs are commonly found together

the owner finds a dead animal or two. Closer observation reveals more animals slow or off feed. The temperature is usually high, generally around 104° to 106°F. Diarrhea is present or develops early. Occasionally animals die without symptoms of diarrhea. The feces contain mucus and blood. In severe, acute cases the animals become gaunt, weak and show great prostration in a very short period. The blood in the bowel discharge of young hogs is generally easily recognized as such, while in older animals it appears darker or chocolate colored.

In the early stages the cecum and colon show congestion and thickening of the walls on necropsy, also congestion of the mesenteric lymphatic glands. Often blood is present in the lumen of the intestine with an increase in the amount of mucus. In later stages, there may be necrotic and diptheritic membranes, with sloughing of patches, which are discharged in the feces with streaks of blood.

For the control of dysentery much emphasis must be placed on sanitation. During the winter months, this presents quite a problem, due to freezing weather, lack of sunshine and muddy yards crowded with live stock. All hogs that appear well should be removed to clean lots. If a concrete floor is available it is much better, since this can be flushed, thus removing much of the infection. Feed and water utensils should be cleaned at least daily. The infected feed yards should be abandoned for a year or more. Newly purchased pigs, if not from a herd known to be free from infection, should be isolated from other hogs on the farm for at least two weeks. This practice is often neglected, with disastrous results.

In past years, I have tried all kinds of medicinal treatment with but little success. This past summer, Dr. J. S. Koen suggested that I try sodium chloride. To date, I have used it on a number of herds with good results except in one case.

The salt treatment is begun by removing hogs from behind cattle, isolating the sick, and placing well hogs on clean ground or concrete floors. Add one gallon of salt (10 pounds) to 50 gallons of buttermilk; add ground oats or barley to make it more palatable. Allow no feed but this salt-buttermilk-grain mixture for four days, then give the grain alone for two days, and repeat. I mix the salt with charcoal and anise to improve appearance and flavor. Good clean water must be easily available to the animals at all times while they are getting the salt.

Herd No. 1.—This herd was examined on June 17th. They were on a blue grass pas-

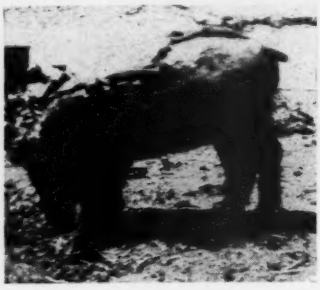
ture that was supposed to be clean ground. A half-dozen pigs were scouring liquid feces with mucus and blood. A diagnosis of dysentery was made. The herd was receiving whole shelled corn, ground oats, tankage, bean meal, salt and minerals.

This herd was put on whole oats soaked in an alkaline mixture morning and night, with buttermilk at noon. The owner reported after a week that the pigs were doing well; but two days later he reported that more pigs were scouring. We continued the same treatment until July 8th (two weeks later). I then performed necropsies on two pigs and confirmed the diagnosis of dysentery. The loss had been small, but more pigs were scouring and the general appearance of the herd was not good. The buttermilk was discontinued and the alkaline mixture continued with tannic acid added. The animals were removed from the pasture and placed on a cement feed floor. A week later the owner brought in two more pigs for necropsy. The diagnosis was the same. This was three weeks after treatment was started.

The herd was then placed on buttermilk, ground oats and salt—one gallon measure of salt in 50 gallons of buttermilk. This was fed four days, discontinued two days, and again fed four days. At this time all pigs had apparently recovered. One week later the herd was given santonin capsules, and two weeks later, vaccinated with serum and virus with no bad aftereffects, which is pretty good evidence that the animals had recovered completely from the dysentery.

Herd No. 2.—In June, 1940, I was called to see a sick herd running in old feed yards, with access to a blue grass pasture. This farm has had trouble for years with dysentery in swine. There were 130, 20- to 30-pound pigs and 25 sows in this herd. Most of them were scouring and several had already died. A necropsy was held on two pigs and one sow. The sows were sent to market and the well pigs were sorted and removed to other quarters. Alkaline treatment with tannic acid was prescribed. About 30 pigs were saved. About three weeks later a second herd of 160 on this same farm but on clean ground began to scour with symptoms of dysentery. They were in a field across a corner of which ran drainage from the infected pasture to which the first herd had access. This herd was placed on salted buttermilk and ground barley. The salt-buttermilk was fed four days, omitted for two days, and again fed four days. In 10 days, this herd had recovered, with a loss of very few pigs. Following the storm of November 11th, the owner was compelled to remove these hogs to the hog house and yards. The disease reappeared. The salt treatment was repeated with a loss of but two animals.

Herd No. 3.—In November, 1940, a client living on a farm on which outbreaks of bloody enteritis had previously occurred, reported that his pigs were developing what he thought was dysentery and asked for treatment. He



Skin form of swine erysipelas

was quite concerned, as he had suffered heavy losses from this disease in the past. I dispensed salt mixed with charcoal and anise, with instructions to take away all grain except ground oats, barley, and buttermilk. The salt was to be added at the rate of one quart to 15 gallons of buttermilk and fed morning and evening. He fed it three times a day. After the fourth feeding, he called me to say in a very excited voice, "These pigs are all sick. A lot have died and it looks like they are all going to die. I think they are poisoned." On arrival at the farm I found the farmer's diagnosis was correct. Of the 56 pigs in this herd at the start of treatment, three were dead and nine others very sick. A few were frothing at the mouth and having convulsions, with all appearances of acute salt poisoning. Three or four were blind, weak, and had little use of the hind legs. I administered 40cc of calcium gluconate intraperitoneally. In all, nine pigs died and three recovered. On necropsy they showed gastritis and edema of the intestinal mucous membrane and enteritis. There were no lesions of hemorrhagic dysentery. It later developed that the hired man had given these pigs a large feed of tankage after they had been without it for several days. Inquiry also revealed that these pigs had not been fed salt until the time of my treatment. Salt treatment was discontinued and no more pigs sickened.

I have used the salt treatment in 20 other herds with good results and no evidence of poisoning. When I first started using this treatment, I was afraid of poisoning, but after using it on several herds, I began to wonder just how much it takes to produce toxic effects. Udall quotes Frohner as stating that the fatal dose of sodium chloride is one-half to one pound. It appears that hogs

acquire a tolerance to salt, if it is fed regularly, and can consume large amounts without visible damage. I have seen hogs poisoned on both dry salt and brine. The

Joint lesions of erysipelas

history in these herds always indicated they had been without salt for a period and then allowed to overeat. An ample water supply is imperative.

Erysipelas

Swine erysipelas is increasing in prevalence at an alarming rate in many sections of the country. This is especially true in the Corn Belt. Here a large transfer of feeder hogs occurs annually, and large numbers are at times shipped into this section from drouth areas. Many truckers show little regard for state regulations and a great many hogs are "bootlegged" in. Another major factor is the community sale barn and yard from which feeder pigs are sold.

Our Iowa sales barn regulations prohibit the sale of big-jointed pigs, except for immediate slaughter. This is to be commended, for Grey, Osteen, and Shoening report that 357 (75.6%) of some 472 arthritic joints from swine yielded *Erysipelothrix rhusiopathiae* organisms upon culture. These specimens originated in 91 counties, in 41 states.

According to research workers, it is difficult to reproduce erysipelas in swine by artificial inoculation. How the disease is transmitted from one animal to another in the field is not definitely known, but it is probable that it is mainly by feed and water contaminated by infected swine. Apparently healthy hogs may be carriers of the infection. Field observations tend to confirm this. I observed a severe outbreak of acute erysipelas on a farm where no new hogs except a boar had been introduced for two years. There had never been a previous outbreak on this farm, according to the owner.

According to B. A. I. Report No. 11, the organism is capable of existence in the soil for at least a year and, under favorable conditions, may multiply there. It resists putrefaction, dessication, and sunlight. In meat it is not destroyed by pickling, smoking, or drying. To destroy the organism by cooking,

These animals exhibit both skin and joint lesions

requires two and one-half hours for a piece of meat six inches thick.

In examining a sick herd, the symptoms found depend on the type of the disease—acute, subacute, or chronic. Often all types exist in the same herd at the same time.

In acute swine erysipelas, the onset is sudden, the temperature high. Prostration is not marked as in hog cholera, except in occasional peracute cases. There is arching of the back and a stiff gait, congestion and reddening of the skin with a scarlet red that blanches on pressure in the early stage. Later, the congested areas of the skin are darker and blanching is not so evident. Often there is vomiting and constipation. A discharge from the eyes is sometimes present as in hog cholera, although not as regularly.

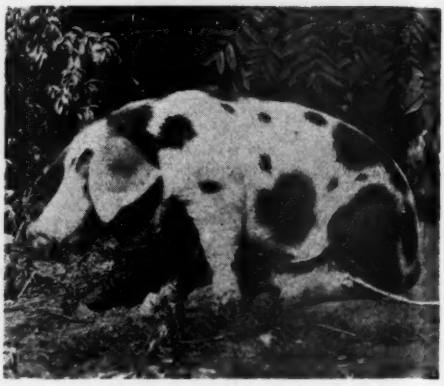
The subacute cases follow the acute attack. The symptoms are stiffness, stilted gait, enlarged joints, swollen legs, lameness, unthriftiness, and often the beginning of skin sloughing.

The chronic form is characterized by stiffness, enlarged joints, unthrifty condition, and sloughing of the skin. The tail and ears often slough off.

Swine erysipelas and hog cholera should not be confused. With the case history, visible symptoms, and the opportunity to perform a necropsy on a few pigs, the diseases are easily distinguishable. I know of

no disease other than erysipelas that produces an arched back, a stilted gait, lameness, swollen legs, and big joints with skin lesions.

Erysipelas serum when administered early is of great therapeutic as well as diagnostic value. The earlier it is used, the better. Often dramatic cures are effected by it within 24 to 48 hours. On one farm where erysipelas has shown up annually in sows, immediately after farrowing, we have injected swine erysipelas antiserum on the appearance of the first symptoms of the disease and had them normal and nursing their pigs in 24 to 36 hours. A laboratory examination should be carried out when possible as an aid to diagnosis. Even though the laboratory findings are negative, erysipelas may be present. The positive findings are conclusive. The organism seems to be more easily recovered in acute cases.



Streptococcic septicemia

Secondary or "mixed infection" pneumonia

No rule can be laid down to follow in handling erysipelas. Cases present different problems. From a scientific viewpoint, erysipelas antiserum is always indicated in sick herds; economically, its use is not always justified.

A point to be remembered is that hog cholera and swine erysipelas may be present simultaneously in a herd. When this condition is encountered, hog cholera serum and virus should be administered to the herd, and erysipelas serum to the animals that are sick. Some veterinarians think that hog cholera serum is quite effective in controlling an outbreak of erysipelas; such has not been my experience. I have used it on a number of hogs that were sick with erysipelas and the results were disappointing.

It is frequently difficult to give a prognosis in a herd. Only a few pigs may sicken and the disease may die out; again, it may become acute and spread rapidly through a herd. In a great many outbreaks the disease is mild, dying out after a few cases, to reappear later in a subacute or chronic form with many cases of arthritis but no death loss. In many cases, treatment of the pigs as they sicken every two or three days is satisfactory. If the disease in a herd is in the subacute or chronic stage, administration of serum to all the animals is uneconomic.

Another point to be remembered is that in any herd of sick hogs that have not been immunized, hog cholera must not be overlooked or mistaken for erysipelas. Dire results will follow such a blunder. If a herd is not immune to cholera, use anti-hog cholera serum and virus if there is the least indication that the ailment may be cholera or complicated by cholera.

When erysipelas appears in the acute form and spreads rapidly in a herd, erysipelas serum should be administered to all

Necrotic stomatitis

members of the herd. The sick animals should be allowed to mingle with the herd, to provide exposure and thus produce a longer immunity than is to be had from the serum alone. If new cases develop after 10 days to two weeks, these individuals may be retreated, or if many sicken the entire herd may have to be retreated with serum to reestablish the passive immunity in those that did not acquire the organism from natural exposure. A second dose of serum is, however, seldom necessary.

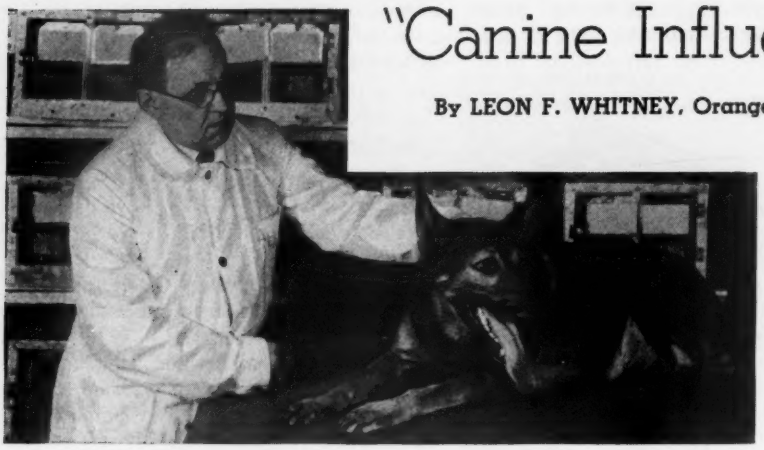
Culture and Serum Immunization. — For the past few years, veterinarians in Nebraska have been using a virulent culture of the erysipelas organism, obtained from the federal laboratory at Lincoln, and erysipelas serum simultaneously in infected areas, thus establishing a lasting immunity. The serum is purchased from a commercial source. The results are reported to be quite favorable.

Veterinarians are now permitted to use an *Erysipelothrix rhusiopathiae* culture in Iowa in conjunction with serum. It is given only to well hogs on farms where infection is known to exist. Its use is regulated by the state veterinarian. The dosage recommended is as follows:

Pigs up to 50 pounds.....	¼cc of culture 5cc of serum
Pigs 50 to 100 pounds.....	½cc of culture 10cc of serum
Pigs 100 to 150 pounds.....	¾cc of culture 15cc of serum
Hogs 150 pounds and over....	1cc of culture 20cc of serum

In 10 to 14 days, the dose of culture is repeated, using double the amount of the first injection. The prescribed dose of serum must not be increased when using the culture simultaneously. As little serum as possible is used. The use of the simultaneous treatment is recommended as early as possible; the earlier the better, if only a few hours after the pigs are farrowed. The product may be used on pregnant sows. In administering the culture, care must be used not to infect the operator. Rubber gloves should be worn.

I sincerely hope that this is the answer to the erysipelas problem, and that its use will be confined to qualified veterinarians. Too much death-dealing virus has already been disseminated by incompetent individuals. It is scarcely conceivable that the state live stock sanitary authorities and the state colleges will rush into the manufacture and promiscuous distribution of swine erysipelas culture as 22 of them did in the case of hog cholera virus, but one never can tell. Before it was done, no one could possibly have believed that the government would permit indiscriminate and uncontrolled distribution of hog cholera virus, much less actually engage in the practice.



"Canine Influenza"

By LEON F. WHITNEY, Orange, Connecticut

NOVEMBER 17, 1935, the author received a letter from a friend in Athol, Mass., stating that some of his beagle hounds were having running fits. All the affected animals were young dogs. Although he did not change the feed, the dogs that did not die recovered from the fits automatically after some days of illness, and remained well thereafter, apparently none the worse for the attack. The author bought four of the dogs which had not yet been attacked and brought them to his kennel. Within a few weeks they began to have violent running fits. The other symptoms were: photophobia, partial anorexia, tenderness about the head, epiphora, injected nictitating membrane, nasal discharge and hypersensitivity to noises. Soon the disease had spread to every young dog in the kennels and to a few older ones. Some died, usually with symptoms of pneumonia, and lesions of pneumonia were revealed on necropsy. Most of the older dogs had very mild cases. Upon examining the records, it was found that the animals which had been affected were those which had neither had distemper nor been immunized against it.

During the winter of 1935-36, genuine distemper broke out in the kennels. It became obvious that the earlier sickness had in no case given any degree of immunity against distemper, and it was therefore concluded that it is a distinct entity.

To the best of my knowledge, no dog with the disease was brought to the kennels during the winter of 1936-37. Yet, on December 7, 1936, a young dog began having convulsions, and again the disease spread among the young dogs. Beginning December 15th, a temperature record was kept for all dogs in the kennels, and a complete record was obtained on 39 dogs which contracted the disease, for a period of from one to several days before the attack started to several days after the animals were again normal; also partial records on many cases in which the dogs were sick before we began taking temperatures. The growth curves which were being plotted for the majority of the puppies were continued. They all lost considerable weight, but by January, 22 of the first 23 cases were entirely recovered and growing rapidly again. (One died of pneumonia after making a partial recovery; her temperature had started to fall, but it rose again to 106.8°F., and she died after two days.)

Several weeks went by, during which a number of young puppies were weaned and placed in the kennels. Twenty-four days after the outbreak was apparently over (January 26, 1937), a puppy showed early symptoms (convulsions). The puppy was

[1] This paper was first submitted for publication in November, 1937, with the title "Preliminary Report on a New Canine Disease." The editor returned it to the author for additional information and for a discussion of the etiological agent. The paper has been held until the present time to allow for the addition of new data, which, together with the previous data, include observations on more than 150 dogs affected with the disease.

placed in close proximity to all the others that had not been attacked as yet, so that they would be exposed. The first to be attacked developed early symptoms six days later. This gave a reasonably accurate check on the incubation period. Just at this time also 19, three- to four-month-old bloodhound puppies were brought to the kennels from Maryland, where they had been raised for me. They too were exposed. All the puppies contracted the disease. One of the bloodhounds and three cocker spaniels succumbed, all of pneumonia.

What appeared to be the same disease appeared in the author's kennels again just at the Christmas holidays in 1938. It swept through the kennels rapidly, 40 puppies being sick at the same time. Only a few temperatures were taken. Casualties were light. Again it was noted that not one puppy that had been vaccinated against distemper, and not one older dog that had been vaccinated or had recovered from distemper, contracted this infection.

In 1939-40 the kennels were free from the disease under discussion, but had a siege of distemper.

This year the disease has appeared again. This time it has not spread nearly as rapidly as usual. The first case appeared January 2, 1941, and as this is written, 34 days later, not all of 38 susceptible puppies have as yet been affected, and the epizootic appears to be over. Ten have escaped. (By susceptible, I mean puppies which have had neither this disease, nor canine distemper, nor prophylactic vaccination against distemper.) In fact, in one case, it has affected but one member of a litter of four puppies being raised together. This is indeed unusual. In previous attacks none escaped. The symptoms, including fits and high temperatures, are the same and the duration is about the same as in previous outbreaks, but the temperatures are not so high and attacks seem to be considerably milder than heretofore. Further, there have been no deaths from pneumonia this year.

■ Whether or not this is similar to the influenza which human beings have is a question still unsettled. However, until this year, each time the dogs have had it, the author has also had an attack of typical human influenza. This year he has so far escaped. The kennel manager, Mr. Edward Lacourciere, has never contracted it from the dogs; but neither has he ever had influenza in his life. An assistant had a very severe case in 1938. The disease has always appeared in the kennels at about the same time that it has been prevalent among humans. Because, so far as can be determined, it has not been introduced by other dogs except the first time, there is the possibility that human visitors transmit the influenza.

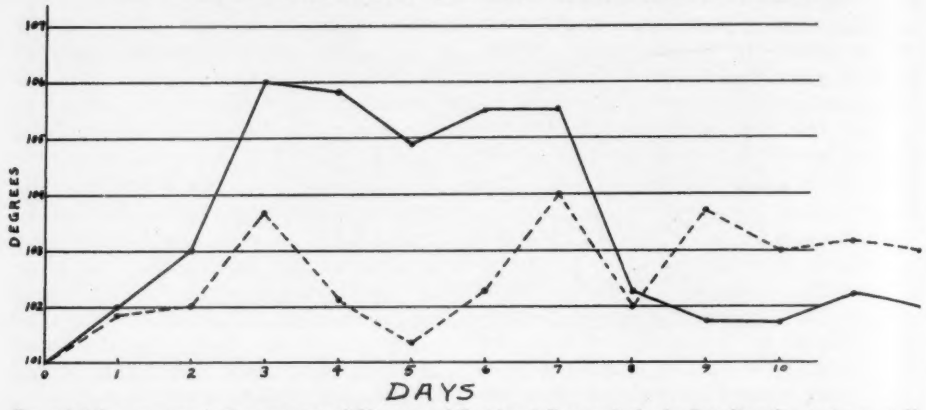
There seems to be a very distinct breed difference in the manifestation of symptoms. Beagle hounds have shown the most violent running fits. Bloodhounds also have been quite severely affected, but to no such degree as the beagles, and cocker spaniel puppies quite often have no fits at all when they are attacked. The temperatures in all three breeds and in several other breeds, on which fewer observations have been

In November, 1928, Bryan reported in this magazine an instance that came under his observation in which he believed a child contracted influenza from a dog suffering from canine distemper. This was the first such report in the literature. Since then three reports of similar occurrences have appeared in medical literature. Doctor Whitney's observations, extending over a period of five years and including more than 150 animals, add materially to the record, although he reaches a different conclusion. This is that dogs are susceptible to an infection resembling influenza in man but differing from distemper.

The latest contribution to the knowledge available on this subject is the finding of the Rockefeller Foundation that a vaccine comprising equal parts of canine distemper virus and the virus of influenza constitutes a valuable preventive of influenza in man.

made, are or more less constant. Undoubtedly there is a definite age tolerance to this condition. Other things being equal the age of dogs start off with dizzy spells, and young dogs often have quite violent fits. In this way the two diseases are very similar.

COMPARISON OF TEMPERATURE CURVES OF "INFLUENZA" AND DISTEMPER



The solid line represents the average of 39 cases of "canine influenza," the broken line the average of 50 cases of canine distemper. The temperature in both cases is normal before and a few days after the 10-day period shown

younger the puppy the more severe the attack.

The graph shows the difference between the temperature curve of "canine influenza" and that of canine distemper, the former made by averaging 39 cases and the latter by averaging 50. The chart shows only the rise and fall of the temperature. The temperatures were normal before symptoms developed; afterward they were normal also unless some secondary invader like pneumonia or enteritis caused trouble.

■ It is interesting to compare "canine influenza" with distemper. In the vicinity of New Haven, a number of kennels have been affected. In several of these, veterinarians have diagnosed the disease as distemper. In the case of sporadic outbreaks among individual dogs kept in homes, several have come to the author's attention which have been diagnosed as distemper and treated with anti-canine distemper serum; the dogs have recovered. In the opinion of the author, they would probably have recovered as quickly without the serum. In all of these cases where temperature charts were kept, they were typical of the "influenza" and not at all typical of the distemper picture.

In the case of distemper, a large percentage of the fits last for about the same period in both. But it has been the author's experience that any disease which causes a rise in temperature to 104°F or over, commonly produces fits in young dogs, and also occasionally in mature animals.

The second point of similarity is that in both cases there are moist eyes and nasal discharge. The difference in this respect is that distemper cases continue to discharge, whereas in the case of "influenza," this symptom usually clears up by the sixth to eighth day after the onset of the disease.

The third point is that the appetite falls off, usually to the vanishing point, in both cases.

The fourth point is that the dogs seem to want to remain very quiet and warm. (However, this might be said about any dogs at the onset of high temperatures.)

■ The points of dissimilarity are interesting. Indeed, there are only two outward signs by which a practitioner called to see a dog suffering from "influenza" can tell whether it is distemper or the less serious malady: (1) the feces are usually not evil-smelling, watery, or discolored, as in distemper, and (2) unlike distemper, congestion around the head is present and ex-

ceedingly painful. If, in attempting to lift a dog suffering from the disease, one touches or even puts one's hands near the dog's head, he may snap or otherwise show objections. He appears to have a terrific headache. Slight, sharp noises will often throw him into a fit; even clapping the hands near the dog seems to hurt him.

In most cases the initial temperatures are somewhat higher than those of distemper; indeed, the average is much higher. This too may be a point to remember in early differential diagnosis. After a few days, it is an easy matter to recognize the difference.

Several experienced and competent veterinarians, who either saw the dogs during the course of the disease, or heard about the epizootic, expressed an opinion that the author was dealing with a mild form of distemper. The author sent a pair of three-quarter grown puppies that had recovered from the disease to the Lederle Laboratories, Pearl River, N. Y., where Dr. Norman Pyle infected them with distemper virus. He reported that both died of typical distemper. From this instance and from our previous experience, there is evidence that the disease described in this paper, with which the author has now had considerable experience, is not distemper.

On the other hand, since the disease often occurs concurrently with human influenza, and since it resembles it so closely, there is at least a strong possibility that the etiological agent is the same.

Summary

A disease, distinct from distemper although resembling it in some respects, and often mistaken for it, has attacked the dogs of the author's kennels four times in five years, each time in the late fall or during the winter. One hundred fifty-eight dogs have been affected.

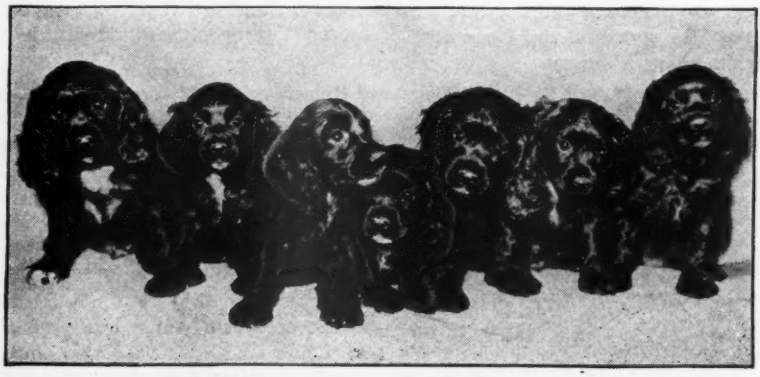
The temperature is higher than in distemper; the duration of the disease is only about a week; and convalescence is fairly rapid, unless pneumonia or enteritis follows as a secondary complication.

The disease does not protect the animal against an attack of distemper; but vaccination against distemper, or recovery from an attack of distemper, protects fully against this disease as well as against distemper.

One epizootic was milder than the others indicating some variation in the infecting agent, or more than one strain.

One of the first symptoms in some breeds is running fits. A distinct breed difference exists in regard to the manifestation of fits due to "influenza," beagles being the most inclined to them and cocker spaniels least among the breeds used in the experiments.

It is suggested that this disease may be "canine influenza," the canine counterpart of human influenza, and that it may be transmitted from dog to man and *vice versa*.



There appears to be a distinct difference in both age- and breed-susceptibility to "canine influenza." In general, young dogs are more susceptible than older ones; cocker spaniels are less prone to "running fits" than beagles or bloodhounds

Infectious Canine Leptospirosis

By CLARENCE H. THOMPSON, JR.
Perry, Kansas
Kansas State College
Class of 1941

Clinical Record

ON JUNE 6, 1940, a four-year-old white-and-liver-marked female pointer, the mother of six puppies five weeks old, was presented at the Bower Animal Clinic and Hospital in Topeka, Kansas, for treatment of a condition provisionally diagnosed as a mixed bacterial infection.

The onset of the sickness had been sudden. Two days previously the owner first noticed that the animal refused food. Hospitalization was advised and a prepared diet was prescribed for the puppies, which the owner valued highly.

The patient had a temperature of 103.6°F. when examined at the clinic. The mucous membranes were slightly congested, with a suggestive icteric tinge in the conjunctiva. There was a slight, thin mucous nasal discharge. The first day in the hospital the patient showed a great thirst and consumed large quantities of water when permitted to do so, followed by vomiting. The inappetence and malaise continued. The temperature varied irregularly between 102.5°F. and 105°F. A fetid diarrhea developed on the second day of hospitalization, and the dog became greatly emaciated and dehydrated. On the fourth day of illness a distinct icterus had developed. This led to a suspicion that the animal might be suffering from Weil's diesase. An ulcerative stomatitis associated with a peculiar fetid odor of the dog's breath became apparent. The condition of the patient regressed rapidly, and death ensued on June 13th, the eighth day of hospitalization and tenth day of illness.

The syndrome, including a fetid breath and diarrhea with buccal ulceration and jaundice developing later, aroused the suspicion that infectious canine leptospirosis might be the entity involved. A blood sample was drawn and sent to Dr. Karl Meyer of the Hooper Foundation, University of California, for examination. The patient died before the laboratory report was received. The laboratory findings confirmed the clinical diagnosis with positive agglutination for the organism *Leptospira icterohemorrhagiae* in dilutions up to 1/3000, and partial agglutination in dilutions up to 1/10,000.

Supportive treatment was started when the patient was admitted to the hospital and was continued throughout hospitalization. It consisted of the intravenous administration of 200 to 300cc of normal saline solution containing 10cc of 50% glucose. Symptomatic treatment included one-third grain of azamine three times daily on the fourth, fifth and seventh days, and 10cc of iron cacodylate on the sixth day of hospitalization.

At necropsy the entire skin and visible mucous membranes were stained a deep yellow. There was a peculiar putrid odor about the body. Newly-formed ulcers on the buccal surface of the cheeks and gums were observed. Examination of the viscera revealed a beginning hemorrhagic enteritis. The liver was degenerated, with a mottled appearance. The urine in the bladder was highly colored. Albuminous degeneration was occuring in the kidneys. All tissues observed were deeply stained with bilirubin.

Discussion

Kelser[1] describes the organism *Leptospira icterohemorrhagiae* as the etiological agent of canine enzootic jaundice. It is a long (6 to 9 microns), closely-spiralled organism capable of active rotation and serpentine types of motility. It is difficult to stain by ordinary methods and is best studied by dark-field examination. It is destroyed by a temperature of 133°F. for 20 minutes. This is the organism which was present in the case described in this report. Another leptospiral organism, *L. canicola*, morphologically

[1] Kelser, R. A., 1938. *Manual of Veterinary Bacteriology* (Baltimore: The Williams & Wilkins Co.), pp. 338-384.

identical with but serologically distinct from *L. icterohemorrhagiae*, has also been incriminated as a causal agent of the disease. The exact relationship between these two organisms and the diseases known as infectious icterus (canine enzootic jaundice, Weil's disease) and dog typhus (Stuttgart disease) is not entirely clear. The consensus is that the two diseases are merely different forms of leptospirosis, dog typhus being the form in which icterus is absent. It appears that either disease can be produced by either organism, although *L. icterohemorrhagiae* is most frequently associated with infectious icterus and *L. canicola* with dog typhus.

Leptospirosis of dogs has been reported as being very prevalent in England and continental Europe.[2] In the United States, it has been reported from the Atlantic States,[3] Ohio,[4, 5] Nevada, Pennsylvania,[6] Michigan,[7] and California.[8] This report adds another state to the area known to be infected. [Since this report was written, another case of the disease, in which the clinical diagnosis of leptospirosis has again been confirmed by laboratory examination, has been treated in Doctor Bower's hospital.]

The death rate in dogs is very high. Hutyra and Marek[9] state that recovery is rare, and that when it does occur, convalescence is prolonged.

The brown rat has been incriminated as the common vector of the disease. In the Detroit outbreak[7] about 25% of the rats trapped carried this organism. Klarenbeek[10] reports the disease in silver foxes, young pigs, cats, and field mice. Rabbits also have been infected.[11] Meyer[8] is of the opinion that there are subclinical cases in dogs which act as carriers and disseminators of the disease, and that the disease is frequently transmitted from one dog to another by copulation. Food contaminated by infected urine is considered the common means of spreading the disease. Contaminated water used for bathing or drinking has also been reported as a means of transmission.[12]

Since the disease in dogs appears to be spreading in this country, and since in addition to the high mortality in dogs there is a public health hazard involved (the same organisms pathogenic for dogs cause Weil's disease in varying degrees of severity in man), the small animal practitioner needs to be on the lookout for it. It is difficult to determine how long before the animal is presented for treatment it may have been discharging the spirochetes in the urine; or at what stage of recovery it ceases to eliminate them. Since it has been demonstrated that the organism can penetrate the unbroken skin, it is necessary to handle leptospirosis patients with extreme care, and to warn owners of the dangers of human infection. The animals should be strictly isolated. As a prophylactic measure, acidifying the urine by feeding a strict meat diet and, if necessary, by placing hydrochloric acid in the drinking water, is recommended. Because it is largely eliminated in the urine, phenothiazine is also to be considered. Rubber gloves should be worn in handling the dogs, and any wounds on the hands should be treated with iodine. A 1:50 hypochlorite solution is recommended for cleaning cages in which leptospirosis patients have been confined. Rats should be eliminated from the vicinity of the hospital, because of their record as carriers of the disease.

Treatment is usually of little avail. Large doses of serum may have some value. Good care and supportive treatment are indicated. Intravenous injections of glucose and saline solutions, along with heart stimulants, are recommended. A workable vaccine has not yet been developed, but there are possibilities along this line.

[2] King, N. S., 1937. Stuttgart disease and nephritis. *Vet. Med.* 32:9, pp. 401-409.

[3] Davis, R. H., J. D. Winn and Erwin Jungherr, 1937. Infectious jaundice of dogs found in Connecticut. *Vet. Bul. Lederle* 6:1, p. 16.

[4] Madden, A. G., 1940. Canine leptospirosis in practice. *Allied Vet.* 11:1, pp. 7-8.

[5] Steele, D. S., 1940. Canine leptospirosis. *Allied Vet.* 11:1, pp. 9-11.

[6] Report of the Surg. Gen. of the U. S. Pub. Health Ser., 1939.

[7] Molner and Meyer, 1940. *Am. Jnl. Pub. Health*, 30, pp. 509-515.

[8] Meyer, K. F., B. Stewart-Anderson and B. Eddie, 1939. Canine leptospirosis in the United States. *J.A.V.M.A.* 95:753, pp. 710-729.

[9] Hutyra, F., J. Marek and R. Manninger, 1938. *Special Pathology and Therapeutics of the Diseases of Domestic Animals* (Chicago: Alexander Eger), p. 943.

[10] Klarenbeek, A., 1938. Einige neuere Untersuchungen über Leptospirosen bei Tieren. *Acta Conv. tert. trop. malar. morbis. 1938*, Pt. I, pp. 381-386.

[11] Welcker, A., 1938. Die Labotoriumsinfektionen mit Weilscher Krankheit. *Zbl. Bakt. I. (Orig.)* 141, pp. 400-410.

[12] Havens, W. Paul, Carl J. Bucher, and Hobart A. Reimann, 1941. Leptospirosis: a public health hazard. *J.A.M.A.* 116:4, pp. 289-291.

Simplifying the Umbilical Hernia Operation

I am prompted to describe this old-time technique in handling umbilical hernia in a colt because it is not in general use and because it seems to me to be the easiest method of taking care of these cases. I have used it on 25 colts. The only one which died was one to which I forgot to administer a prophylactic dose of tetanus antitoxin.

The type of wooden clamp used by Doctor Bayles

Hernia operations with the knife, or with needle and suture, are harder to perform and are far more dangerous. The concave metal clamp in general use has several disadvantages. It is heavy and is easily caught in a gate or fence. If it is screwed down a little too tight, it will cut the tissues too fast, and the sac may come off before healing, allowing the intestines to spill out all over the premises.

Instead of the metal clamp, I use a wooden one consisting of two pieces of pine ¾ inch by ½ inch by 6 to 8 inches, held together at each end by a 3/16-inch bolt, lockwasher and nut (see illustration). The inside surface of each stick is slightly hollowed out and filled with a good astringent wound ointment.

The operation is best performed when the colt is about one year old. The animal is cast and held squarely on its back. The protruding sac of skin is pulled up sharply so that the intestine falls back into the abdominal cavity. One can then feel the hernial ring, which is usually from one to two inches in diameter. When the opposing fingertips make contact through the skin one can assure oneself that all the viscera are back. The clamp is then placed longitudinally on the skin and pushed down as tightly as possible against the hernial ring, in such a manner as to include only the skin, and the screws are tightened until the ends come together. The clamp should extend about one inch on each side of the sac. It will cause the colt pain for perhaps 30 seconds after which there is no discomfort. The colt is allowed to get up. Inflammation soon sets in, and the sac and clamp drop off in from 10 to 20 days. No noticeable scar is left.

I once used this method successfully on a large three-year old filly with a protruding hernia five inches across. The sac and clamp dropped off in three weeks. The operation increased her value several fold.

The advantages of the wooden clamps over the metal are: They are cheaper; they cause the animal less discomfort; and they are simpler to adjust. After the operator becomes acquainted with their application, he can put one on and go home to bed and sleep that night with the knowledge that all is well.

G. W. BAYLES.

Marion, Ill.

* * * *

Hematoma or Normal Collection of Blood?

In my opinion the condition described in the case report entitled "Hematoma of the Brain of a Cat" (*Vet. Med.*, February, 1941, p. 112) was erroneously diagnosed. The condition described was not in my opinion a hematoma, but rather the normal structures in the cranium—the so-called sinuses of the dura mater. These are venous vessels and naturally fill with dark blood.

The symptoms the cat presented are relatively common in practice. The prognosis is good. It is usually considered as functional ataxia, or vestibular paralysis, or myelitis resulting from toxemia. At any rate, it is certainly in most instances a toxic nervous dysfunction.

THEODORE ALLEN

Blue Point, L. I., N. Y.

Salt Treatment for Bloody Diarrhea

What is known as the "salt treatment for enteritis in feeder pigs" is enjoying some popularity among a considerable number of Iowa practitioners. It is administered as follows:

Ten pounds of salt is dissolved in 50 gallons of water (or three to four pounds in 15 gallons). The affected animals are given all the oats soaked in this solution they will eat twice daily for a period of four days, no other food being allowed. After three days of normal feeding the treatment is repeated for another four-day period. Usually this is sufficient to stop diarrhea and show marked improvement.

It is essential to the success of the treatment that plenty of fresh, clean water be available to the animals at all times, while they are on the salt-impregnated diet. It must be near where the salt-soaked oats are fed. If it be even only a few rods away the swine will not drink it as often and as plentifully as they should and the results of the treatment will be unsatisfactory and may even be disastrous.

Another method of giving the salt treatment considered best for hogs that are following cattle is to take the animals away from the cattle, pen them up where there is no food to be had and then give them all the salted buttermilk they will drink for four days; then buttermilk that is not salted for three days. The buttermilk-salt treatment is then repeated. For this treatment salt is added to the buttermilk at the rate of 10 pounds to 50 gallons.

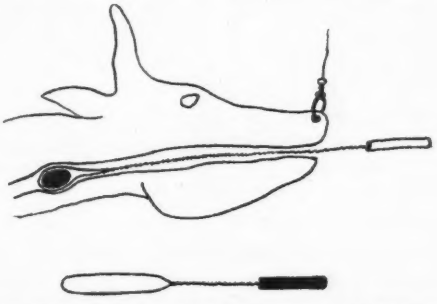
Some use this salt-and-buttermilk regimen as a prophylactic, i.e., subject the pigs to it before they are turned into the cattle lot. This is regarded as good practice for all sales barn or stock yards pigs.

It has been found in a few herds that 10 pounds of salt can be added to 15 gallons of water in which three bushels of oats are soaked, and the mixture fed twice daily for three to four days; the salt is discontinued for three days, and then the salt-soaked oats fed again for another four days. It has been demonstrated by at least one feeder of large numbers of hogs that they will tolerate 10 pounds of salt in 15 gallons of water with three bushels of oats soaked in it for six days, after which they appear to eat less, indicating that a possible salt tolerance has been reached.

Salt poisoning has been reported to have occurred in only a very few instances and in each case the hogs did not get an ample supply of water during the salt treatment period. In fact, salt poisoning is probably a myth, although it is known that poisoning may result from certain combinations in which salt is the principal ingredient (for example, the brine in which salt pork has been cured).

* * * *

A HANDY GADGET FOR RELIEVING CHOKE



The diagram shows a simple instrument which I have used for a number of years to relieve bovine choke caused by the lodging of corn cobs, apples, hedge apples and the like in the esophagus. The instrument is made from No. 9 galvanized wire (clothes line wire), which is very rigid and does not bend easily when made up as illustrated. The loop can be changed in shape easily to fit objects of varying shapes and gullets of different sizes

With a bull lead fastened to a short piece of rope well lodged in the nose, there is no need to use a mouth speculum or to tie the head to the manger; simply raise the head until the neck straightens out, slip the wire loop down the throat until it is past or even with the object, give a slight twist to snare it within the loop—and out it comes. The job takes only about one minute after the animal is restrained, and it is done with a minimum of injury. No more special restraint, tussling, muss or fuss!

Anyone who has tried to remove a hedge apple or corn cob from a cow's throat and had his hands and arms skinned on the animal's sharp molars, will appreciate the handiness of this instrument. It could be made with a loop on both ends, in which case the loop not being used would serve as the handle.—*J. F. Callison, Moweaqua, Ill.*

Removal of Dentigerous Cysts

Dentigerous cysts or odentoma are, I believe, more common than is generally supposed, i.e., not all of them are diagnosed correctly. It can be agreed that they are rare in cattle, sheep and swine, but in horses one sees them from time to time. I have kept no record of the number of these tumors I have operated upon, but am convinced it must exceed half a hundred. I have a considerable collection of teeth removed from such tumors, six of the better formed being shown in the accompanying illustration. Many as shapely and some even better formed have been left with clients who wished to keep them and with veterinarians with whom the cases were seen in consultation. Perhaps more often than otherwise one finds several small toothlike formations in these tumors. The most recent one treated was such a case, containing literally a handful of small pellets some no larger than grains of wheat. They weighed in the aggregate 6½ ounces.

Six of the teeth from odentomata removed by the author

These dental teratomas are usually attached to the temporal bone externally, the enlargement appearing in the region of the ear, but they may appear elsewhere. Hutyra and Marek mention one located wholly within the cranial cavity, and of course those who have done much cryptorchid castration have seen them in the testicle. Not infrequently they are deeply embedded in the temporal bone and sometimes completely surrounded by this bone.

Dental teratomas are an abnormality of early embryonal development. They begin to grow about the time the normal teeth are erupted, but are commonly unnoted by the owner until the colt is two and one-half to three years of age. About this time, or a little later, a fistulous opening appears on the surface. It is connected to the interior of the cyst or tumor. Usually it leads from the tumor direct to the surface below the ear, but sometimes the tract is tortuous, discharging some distance from the tumor.

The treatment of these tumors is purely surgical. A liberal incision should be made over the tumefaction down onto the hard object. Where this brings into view one or more teeth they should be removed. Usually they can be withdrawn with appropriate forceps without much difficulty. Sometimes they require to be chiseled out bit by bit. Sometimes the misplaced teeth are covered by the outer plate of the temporal bone, i.e., lie wholly within this structure. In such case the bony plate is first chiseled off and the teeth removed with forceps or by chiseling as circumstances may require. O'Connor counsels against chiseling out these tumors because of the likelihood of injuring the brain. He states that if they cannot be removed with forceps they had best be let alone. Such has not been my experience. I have never seen any serious consequences from chipping them out with a chisel where they could not be removed with forceps. Of course one must perform this chiseling operation with care, realizing all the time that the surface of

the brain is distant but a small fraction of an inch.

Healing is prompt and spontaneous providing all the tumor structure is removed. The literature states that after the removal of all tooth structures in these tumors new teeth sometimes develop, causing a reappearance of the condition. Such has not been my experience, but I can see how the operator might easily overlook one or two of the very small teeth and not remove them. If this occurred these teeth might very well continue to grow and bring about recidivation.

T. A. SIGLER

Greencastle, Ind.

* * * *

Agalorrhea in a Jersey Heifer

December 14, 1940, the ambulatory clinic of the Division of Veterinary Medicine, Kansas State College, was called to a well-managed dairy herd close to Manhattan to see a 26-month-old Jersey heifer weighing 860 pounds. The heifer had had a normal parturition on December 13th, but refused to "let down" her milk.

The term agalorrhea is defined as "absence or arrest of flow of milk" and was applied to this condition instead of the term agalactia because, as shown later, milk was present in the udder.

The heifer's temperature, pulse and respiration were normal. The udder was edematous and there was some swelling anterior to the udder, as is common at the time of parturition.

Several attempts had been made by the herdsman to get the heifer to milk. Her udder was bathed with warm water for 30 minutes and then was massaged for 45 minutes but both of these methods failed. Then several calves were allowed to suckle, but she refused to give milk to them. In three different attempts to milk the heifer in two days about one-half pint of milk was obtained at each attempt.

After our arrival the herdsman attempted to milk the heifer again, this time obtaining about one pint of milk. The heifer was given intravenously 10cc of posterior pituitary extract, U. S. P. XI; within two minutes the milk was dripping from her teats, and within ten minutes 16.8 pounds of milk had been obtained. The next morning it took about five minutes to start the milk flow, but after that she milked normally. She was milked three times a day, giving eight pounds the next morning, 12.2 pounds at three o'clock, 7.6 pounds at midnight and 10.1 pounds the following morning.

Very little can be found in the literature of cases of this nature, and according to dairymen they seem to be quite unusual in cows with a suckling calf.

Ely and Peterson[1] state that after an injection of adrenalin a cow will stop the milk flow within 30 seconds, and that after the injection of posterior pituitary extract the flow will begin within 30 seconds. They advance the theory that the positive act of ejection of milk is caused by the presence in the blood stream of one or more products of the posterior lobe of the pituitary gland that cause contraction of the smooth muscles in the udder; and that failure to "let down" milk is caused by an increase in the blood of adrenalin, which apparently has the opposite effect in causing the alveoli and ductule musculature to relax. They believe that the presence of these products (posterior pituitary products and adrenalin) in the blood is brought about by sensory stimuli reaching the central nervous system from a variety of sources. Fright and exercise have been shown to be common causes for an increase in adrenalin output.

FRANK FLIPSE, K. S. C. '41.

Manhattan, Kans.

[1] Ely, Fordyce, and W. E. Peterson, 1940. Ejection of milk from the mammary gland. *Jnl. Dairy Sci.*, 23:6, pp. 536-37.

Bovine Triplets

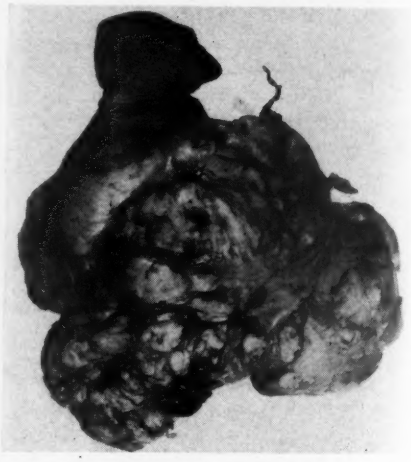
Canine Splenic Fibrosarcoma

December 2, 1940, a liver and white pointer bitch, seven years of age and normally weighing about 55 pounds, was presented for examination. According to her owner she had been a very healthy dog all her life and was apparently normal up to November 20th, except for the fact that she had not shown signs of estrum for 18 months previously. Before this time she had come in season regularly about every six months. Also, for about one year before this time, the dog showed signs of being pregnant from time to time. On November 15th she had been kicked by a mule, but seemed to suffer no after-effects. The dog worked all right and seemed normal the first two days of the bird season, but after that she became increasingly listless, off feed, and began to lose weight.

At the time of observation the dog was about 10 pounds underweight, dull, sluggish, and off feed. She was dehydrated and very thirsty. Her mucous membranes were very pale and the sclera of the eyeballs was yellowish in color. The temperature and respirations were normal, but the force of the pulse beat was very weak. On palpation we could feel a large, rounded, hard mass about the size of a football in the abdominal cavity. The mass lay more to the left side and seemed to be somewhat moveable. The abdominal cavity was distended in this region. By percussion and palpation we were also able to detect a quantity of fluid in the abdominal cavity. At this time we made a diagnosis of a neoplasm in the abdominal cavity and advised an operation. The owner refused.

December 17th the dog was again brought to the hospital. She presented the same symptoms already described, but much augmented. She was now 25 pounds underweight, greatly dehydrated, and very weak. The owner requested that the operation be perfomed, although no hope of recovery was given. The dog succumbed a few minutes after the beginning of the anesthesia.

On necropsy a great number of tumors were found in the abdominal cavity. The diaphragm, mesentery, abdominal walls, and liver were studded with tumors varying from the size of a matchhead to the size of a hen's egg. The largest and most interesting involved the spleen. This one was the size and shape of a football and weighed approximately five and one-half pounds. It



Fibrosarcoma of the Spleen

had completely taken over the spleen in its central part, and only the two extremities protruded beyond the tumor mass. It lay partly embedded in the liver and had displaced most of the surrounding viscera. It, as well as the other tumors, was very firm, nodular in appearance, very vascular and of a reddish gray color. There was about a gallon of rust-colored fluid in the abdominal cavity and the abdominal walls were flecked with a rust-color pigment. The liver showed signs of albuminous degeneration. The rest of the body and its organs were apparently normal.

Sections of the large tumor involving the spleen were examined microscopically. Mature fibroblasts were found, as well as many immature forms whose embryonic nuclei showed definite stages of mitosis. A diagnosis of fibrosarcoma was made. Apparently the dog was affected with a rather slow progressive, malignant, fibromic and metastatic type of tumor involving the entire abdominal cavity. This malignancy caused severe secondary clinical manifestations and under natural conditions would have caused the death of the dog within a short time.

FRANK LICHLYTER, K.S.C. '41.
Manhattan, Kans.

Abstracts

Action of Heparin

A single dose of heparin sufficient to raise the clotting time of the blood of the anesthetized dog to over six hours did not prevent the agglutination of platelets in the presence of what appeared to be a maximal stimulus.[71] With larger doses of heparin, the effect of platelet agglutination, unlike that on the clotting time, took 15 to 50 minutes to develop.

The authors present evidence which suggests that even the most extensive injury to arteries or veins never results in a maximal stimulus to platelet agglutination. The dose of heparin necessary to prevent the formation of platelet thrombi in an injured blood vessel is, for this reason, much smaller than that required to prevent the process in a glass cell.

The findings suggest that, in the presence of even a little heparin, an effect on agglutination previously produced by a higher concentration may persist.

* * * *

Gastroscopy in Dogs

Gastroscopy in the dog is easy because of the large esophagus.[72] A rigid gastroscope is preferred to a flexible one. The dog should receive no food or water for 12 hours before the examination. It may then be anesthetized by intravenous injection of a 5% solution of nembutal (local anesthesia has not proved satisfactory) and placed in dorsal recumbency. The mouth is held open by a gag. The left index finger of the examiner is introduced into the mouth and the epiglottis is lifted somewhat. The right hand then grasps the instrument like a pencil, introducing it exactly in the middle line, and pushes it into the stomach.

Visualization of the pylorus, which has been considered impossible with the gastroscope, is accomplished as follows: In the dorsal position the angulus will be found in the 2 or 3 o'clock position of the gastroscope. If then the position of the dog is changed so that its head is hyperextended, hanging down over the edge of the operating table (always supported by the hand of an assistant), the tip of the instrument will be removed from the posterior wall, as a result of a lever movement, and then suddenly the whole of the antrum, and at its end the pylorus, will appear in the visual field.

The color of the dog's stomach mucosa varies from pinkish gray to light pink, pinkish red, or reddish.

* * * *

Milk—The Most Remarkable Food

Milk is a unique food and remarkable in many ways. Although it contains but 13% of solids and has a specific gravity of only 1.030, it is the most satisfactory food nature produces.[70] Synthetic substitutes are but superficialy similar. It is a product of the blood formed by a specific cellular activity of specialized glandular tissue. Some of its ingredients are in solution, some partly dissolved and partly suspended, and others entirely suspended (colloid). Lactose, citric acid, potassium, sodium, chlorine and vitamins A and C are in solution. Lactalbumin, globulin inorganic phosphorus, calcium and magnesium are partly in suspension and partly in solution. Fat, casein, vitamins A, D and E are collodial. Yet, in spite of the complex makeup, milk has a uniform texture and does not show any precipitation. The average ph is 6.6, the freezing point 0.55° C. The digestibility of its protein is 91.8%; fat, 99%; and sugar, practically 100%. Of its total calories, the protein furnishes 19% which is sufficient for normal growth. The unique biological value of milk lies in the similarity of its amino acids to those of the tissues it is destined to build. Vegetable or cereal proteins are not so efficiently utilized as those of milk, which contains 21 amino acids, including nine essential for growth.

Butterfat contains 11 or more fatty acids and small amounts of cholesterol and phospholipids. Lactose is a precious ingredient

[71] Solandt, D. V., and C. H. Best, 1940. Time-relations of heparin action on blood-clotting and platelet agglutination. *The Lancet*, 238:23, pp. 1042-1044.

[72] Schindler, Rudolf, 1940. Gastroscopy in dogs. *Am. Jnl. Digestive Dis.* 7:9, pp. 391-392.

[70] Regan, Joseph C., 1940. Milk—the most remarkable food known to man. *Certified Milk*, 15:174, pp. 7, 11, 18.

in the nutrition of the young. Further, to the value of milk as a source of energy, there must be added the actions of vitamins A, D and E. Its highly assimilable forms of calcium and phosphorus in liberal amounts are prime factors in maintaining the rate of growth. In fact, milk is the best source of calcium. Except for green vegetables, all other ordinary foods rate low in calcium. On this account, milk is the main essential in bone building, in developing the soft tissues and in maintaining the neutrality of the body fluids. Its low content of iron, copper and magnesium challenges the claim that it is a complete food, although when fed exclusively to albino rats, it gives normal growth and normal blood picture.

Ration, health, hygiene and handling methods are all concerned in the production of quality milk. The cow is no exception to the rule that an adequate ration impairs the animal's nutrition and the qualitative value of the milk she produces. The amount and quality of the protein fed definitely alters the composition of a cow's milk. The vitamin intake is particularly reflected in the quality of the milk secreted.

Although cow's milk contains vitamins A, B_1, C, D, E, and G (B_2), the cow has but limited capacity for storing these factors and little if any ability to synthesize them. Herein lies the importance of feeding in milk production. The variation is striking. An example is vitamin A which may vary in milk from 2.5 Sherman units from cows on a low vitamin-A diet to as high as 50 Sherman units from cows on pasture. Vitamin B_2 (G) can be increased possibly 50 to 75% by feeding a ration rich in that respect. There appears to exist some ability to construct vitamin B_1 by a specific type of bacterial fermentation in the rumen but in the case of vitamin C the content in milk corresponds to the intake. Likewise the vitamin D content depends upon the cow's diet. Processing, including pasteurization, reduces the vitamin C content to small amounts.

There are still unknown dietary essentials contained in milk but on the whole certified milk ranks high because certified herds are fed a better-than-average grade of forage during the winter months.

Book Review

Photodynamic Action and Diseases Caused By Light. *By Harold Francis Blum,* Ph.D. Research Fellow, National Cancer Institute, National Institute of Health, American Chemical Society, Monograph No. 85. 312 pages, illustrated. Reinhold Publishing Corporation, New York, 1941. $6.00.

This is the first effort to systematize and correlate the findings of many investigators in this important field—one on which all veterinarians should be concerned. In writing the text, the author had medical scientists and biologists in mind, hence he introduces the elementary principles of the physical aspects of radiation. Likewise, the details of photochemistry are presented. For the benefit of those unfamiliar with the field, the general nature of photobiological effects is also explained.

The greater portion of the text is devoted to diseases caused by light in man and in domestic animals. For example photosensitization by sunlight, drugs, cosmetics, plants, and certain substances encountered in industry are thoroughly discussed.

Of special concern to the veterinarian as well as to research workers in animal husbandry is Part III, treating of diseases produced by light in domestic animals, including general diseases, hypericism (St. John's-wort poisoning), geeldikkop (yellow thick head), and fagopyrism (buckwheat poisoning), as well as other diseases attributed to photodynamic action. All of these are economically important.

The author brings to light his rich experiences of research in a little known or understood field. His training as a physiologist helps to simplify a subject that ordinarily might "stump" the average scientifically trained reader. The text is carefully documented, presenting a bibliography of approximately one thousand references. The book performs a distinct function in clearing up obscurities which have surrounded the several diseases resulting from light-sensitivity.—*V. Lewitus.*

You may obtain any of the books reviewed in this department by sending your remittance of the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill.

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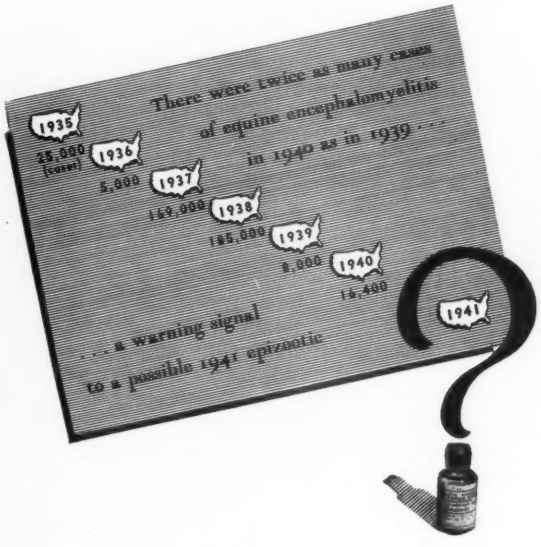
There were twice as many cases of equine encephalomyelitis in 1940 as in 1939—a warning signal to a possible 1941 epizootic. Unvaccinated horses are susceptible to attacks of this dreaded disease which is capable of decimating the horse population. The horse owner has at his command the most effective defense measure —vaccination. He should be encouraged to make timely use of it and insure against losses. It pays to vaccinate!



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The Australian Chemical Institute is reported to have developed a liquid form of meat that retains all the flavor and food value of regular meat.

■

Many are of the opinion that infectious canine leptospirosis is more widespread in the United States than the number of cases reported would indicate; all agree that the disease is spreading. The discussion on pages 220 and 221 represents the first case reported from Kansas. . . . Midwestern practitioners interested in canine leptospirosis will have an opportunity to hear more about it at the annual meeting of the Midwest Small Animal Association at Burlington, Ia., April 3rd. H. C. Smith of Fort Dodge is on the program for a discussion of the disease, and Dr. J. H. Krichel of Keokuk will present some case reports.

■

John R. Mohler, Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, has accepted the invitation of the American Museum of Health to serve on its newly created Scientific Advisory Board, comprising 77 outstanding leaders in health and medicine. . . . Chief Mohler assisted in the development of the Museum's World's Fair exhibits which were seen by nearly 12 million persons, through his service as Chairman of the Special Committee on Veterinary Medicine in connection with the General Advisory Committee on Medicine and Public Health. The Museum will open a permanent exhibit on the site of the Fair grounds next summer.

■

We pass on without comment the news that the first prize winner in the American composers' contest recently conducted by the Chicago Symphony Orchestra, Carl Eppert's Two Symphonic Impressions, is, basically, "a musical interpretation of the rôle of vitamins in the fight against disease." . . . Further, the Two Impressions are drawn from a projected ballet in which the dancers will depict the vitamins and the various deficiency diseases which they cure. . . . The *Chicago Tribune's* music critic, Edward Barry, comments favorably on the work, adding gravely, "The emotional impact of the music is strong. The ecstasy one would experience at the disappearance of one's rickets in the face of vitamin D is ably projected. There is another passage which may be interpreted as an expression of the satisfaction of humanity at the news that keratinization of epithelial tissues may be arrested by doses of vitamin A."

In view of recent work on human influenza, Doctor Whitney's theories about "canine influenza (pages 216-219) are most interesting. Comment from small-animal practitioners, who routinely handle many cases of distemper and distemper-like syndromes, is invited.

■

The February issue of *The National Horseman* contained an informal writeup of Dr. J. P. Gardner of Kingston, Ohio. Doctor Gardner was thus honored because of his hobby of breeding and raising saddle horses, and his enthusiastic promotion of the Walking Horse in Ohio. Accompanying the article is a picture of the doctor on his grey Walking Mare, and a rather lengthy poem of his own composition on the subject "The Old Grey Mare *versus* the Automobile." Two typical stanzas of this run:

"When you've raised a horse from colthood,
Taught her how to trot and rack,
There's a heap of satisfaction
Just to sit upon her back.

"So for me the modern auto
Is just made for wear and tear.
Never really learned to like it,
But I love that old grey mare."

■

With the usual three-year County residence requirement waived, the Los Angeles County Civil Service Commission has just announced an examination for the position of Veterinarian. Beginning salary for the position is $225 a month, with possible advancement to $270.

In order to qualify to take the examination, men between the ages of 21 and 55 must have been graduated from a veterinary college recognized by the Bureau of Animal Industry of the U. S. Department of Agriculture. Students in such colleges who will receive their degrees by June 30th of this year will be allowed to participate in the examination. Veterinary experience is desirable but not necessary.

Applications to take the examination must be filed with the Commission by Tuesday, April 15th. Application blanks and additional information can be obtained by writing to the Los Angeles County Civil Service Commission, Room 102, County Hall of Records, Los Angeles, California. If a sufficient number of applications are accepted from persons outside of Los Angeles County, it is possible that arrangements will be made to hold the written examination in other localities.

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Purified aluminum hydroxide is selective in its action as it almost completely adsorbs the antigens to the comparative exclusion of other substances present. The antigens remain in the adsorbed state until injected. The various aluminum salts (known as "alum") on the other hand have an inadequate adsorptive effect except in the presence of aluminum hydroxide and even then such adsorption is both nonselective and reversible. As a result, not all of the antigens are adsorbed and those that are may go back into solution.

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Mixed Bacterin (Porcine) Formula 1

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Progress Made on Equine Influenza Vaccine

Progress in the development of vaccine for the prevention of respiratory diseases, which frequently occur among young horses mobilized for conditioning, is reported by the War Department.

Among the major projects of the Army Veterinary Corps Laboratory, established at the Quartermaster Remount Depot, Front Royal, Virginia, are studies of equine influenza, strangles and other associated respiratory conditions. The laboratory reports satisfactory progress is being made toward the perfection of vaccines for the prevention of these maladies.

Gratifying results are also reported on the use of sulfanilamide in the treatment of influenza complicated by pneumonia, which has occurred among recently purchased animals. Reports appear to indicate that the usual high mortality rate of these complicated influenza cases will be reduced materially by the use of this drug.

Influenza and associated conditions appear on an extensive scale when large groups of animals are purchased in various sections of the country and concentrated at remount depots or other Army posts.

Army Veterinary Corps

Transfers.—Col. Clell B. Perkins, from headquarters, Eighth Corps Area, Fort Sam Houston, Texas, to headquarters, Third Army, San Antonio, Tex., March 3; Lt. Col. Harry J. Juzek, from Vancouver Barracks, Washington, and additional duty as attending veterinarian, Portland, Ore., to Fourth Corps Area Service Command, Camp Livingstone, La., March 3; Lt. Col. James A. McCallam, from Fort Sill, Okla., to headquarters, Eighth Corps Area, Fort Sam Houston, Tex., March 3; Lt. Col. Harry L. Watson, from Fort Huachuca, Ariz., to Phoenix, Ariz; Maj. Herbert M. Cox, from Fort Bliss, Tex., to Fourth Corps Area Service Command, Camp Shelby, Miss.; Capt. Edgerton L. Watson, from Fort Hamilton, New York, to Indiantown Gap Military Reservation, Pa., March 3; 1st Lt. Edwin J. Sunderville, from Fort Oglethorpe, Ga., to the Chicago Quartermaster Depot, Chicago, Ill., for temporary duty for approximately one month for the purpose of pursuing a course of instruction to begin February 10, and then to the Atlanta General Depot, Atlanta, Ga.

Revocation of Orders.—So much of Special Orders as assigns Maj. Verne C. Hill and Capt. Curtis W. Betzold to headquarters, South Central Remount Area, San Angelo, Tex., and

IN CANKER
OTORRHEA
EAR MITES
VETERINARY *Auralgan*
Veterinary Division THE DOHO CHEMICAL CORPORATION NEW YORK - MONTREAL - LONDON

Fort Bliss, Tex., respectively, upon completion of their tour of foreign service, is revoked.

Veterinary Corps Reserve

Ordered to Extended Active Duty.—Maj. John W. Burke, to Carlisle Barracks, Pa.; 1st Lts. Tyler J. Young, to Army Medical Center, Washington, D. C.; John L. Cox, to Fort Bliss, Tex.; Louis E. Stanton, to Carlisle Barracks, Pa.; Roy A. Resseguie, to Chicago Quartermaster Depot, Chicago, Ill.

Transfers.—Capt. Guy H. Todd, from Fort Riley, Kans., to the 3rd Cavalry Brigade, Fort Riley; 1st Lts. Henry Donelson, from Fort Sam Houston, Tex., to San Antonio General Depot, San Antonio, Tex.; Walter A. Anderson, from McChord Field, Washington, to the Hawaiian Department, sailing from San Francisco March 22; Herman A. Jokerst, Marion J. Jones, Carl H. Koll, James H. Hathaway, and James H. Watson, from Fort Riley, Kans., to 3rd Cavalry Brigade, Fort Riley; Emil L. Koch and Clifford N. Decker, from Fort Snelling, Minn., to 3rd Cavalry Brigade, Fort Riley; Howard E. McCutchan, from Fort Meade, S. D., to 10th Cavalry, Fort Riley; Alton M. Coddington, from Fort Des Moines, Ia., to 10th Cavalry, Fort Riley; Harold L. Geick, from Fort Snelling, Minn., to 7th Corps Area Service Command, Fort Riley; Thomas McC.

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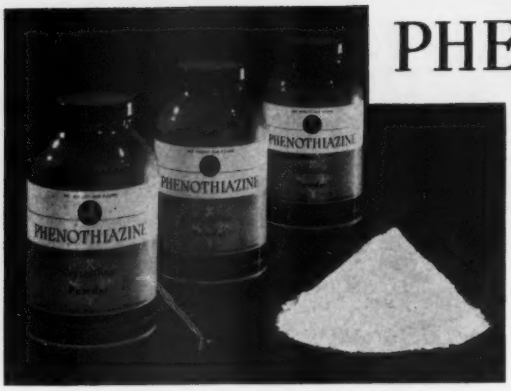

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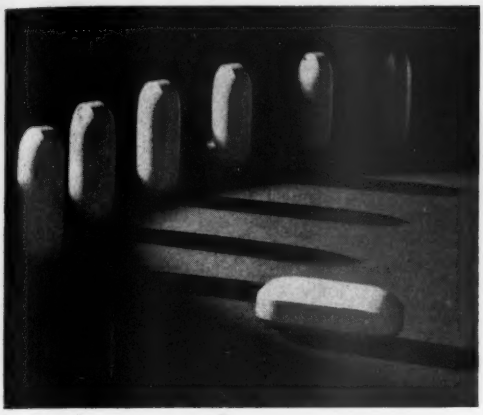
Eagle, from Jefferson Barracks, Mo., and temporary duty at the Chicago Quartermaster Depot, to 2nd Cavalry Division, Fort Riley, March 10; Edward J. Watson, from Presidio of Monterey, Calif., and temporary duty at the Army Medical Center, Washington, D. C., to Fort Ord, Calif.

Lieutenant Colonel Lloyd C. Ewen Dies

Lieutenant Colonel Lloyd Clifford Ewen, Veterinary Corps, was fatally injured February 18th, while returning to Front Royal, Virginia, from a trip in connection with the purchase of Army animals.

Col. Ewen at his desk at Front Royal



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Colonel Ewen was born in Blanchard, North Dakota, on April 4, 1891. He was graduated from the School of Veterinary Medicine, University of Pennsylvania in 1917, and was commissioned in the Veterinary Corps July 16, 1917, attaining the rank of lieutenant colonel August 3, 1937. He served first at Fort Brown, Brownsville, Tex., then consecutively at Fort Ethan Allen, Vt., Fort Reno, Okla., the Panama Department, Fort Howard, Md., Fort Sam Houston, Tex., Hawaiian Department and the Front Royal Remount Depot. At the time of his death, he was serving with the Eastern Remount Area, with headquarters at the Front Royal Remount Depot. He was an honor graduate of the Army Veterinary School in 1923.

Col. Ewen was buried in Arlington Cemetery with full military honors. His widow, Mrs. Eulalya Ewen, his mother, Mrs. Josephine Ewen, a brother, Amos V. Ewen, and two sisters, Mrs. Charlotte Walker and Leila Clark Ewen, survive.

■

Dr. Eugene B. Ingmand, former assistant executive secretary of the A. V. M. A., has accepted a position with the Jensen-Salsbery Laboratories, Inc. He takes over the duties of Dr. R. L. Anderes, who has been called to active service at the Army Supply Depot, St. Louis, Mo.

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Coming Meetings

Kansas City Veterinary Medical Association, monthly meeting, Hotel President, Kansas City, Mo., March 18th.

Massachusetts Veterinary Association, monthly meeting, Hotel Westminster, Boston, Mass., March 26th.

Keystone Veterinary Medical Association, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, March 26th.

Midwest Small Animal Association, annual meeting, Hotel Burlington, Burlington, Ia., April 3rd.

Maine Veterinary Medical Association, quarterly meeting, University of Maine, Orono, Me., April 9th.

American Animal Hospital Association, 8th annual meeting, Hotel Statler, Buffalo, N. Y., April 23-26.

■

Deaths of Veterinarians

J. J. Hogarty, 72, Oakland, Calif., San Francisco Veterinary College 1900, June 22, 1940. Doctor Hogarty taught at his alma mater for several years prior to going into practice. In 1917 he was appointed live stock inspector for Alameda County, Calif., retaining this post in conjunction with his private practice until 1937, when he retired. He served on the state board of veterinary examiners under two gov-

Classified Advertisements

For Sale, Wanted, etc., $2.00 for 25 words or less; additional words, 8 cents. 25 cents extra when replies are sent in care of VETERINARY MEDICINE

JUDY'S DOG ENCYCLOPEDIA, complete, with free supplements—all breeds and subjects, $5.00. Dog World, all-breed monthly, $2.00 for one year, $3.00 for two years, $5.00 for five years. JUDY PUBLISHING COMPANY, 3323 Michigan Blvd., Chicago, Ill.

"HORSESHOES OF INTEREST TO VETERINARIANS" by the late Prof. Henry Asmus, Cornell University. This new book on horseshoeing contains 164 illustrations of shoes for both healthy and defective hoofs and for several kinds of lameness, with full description of each. Useful to the general practitioner as well as to the specialist on lameness in the horse. Price $1.00. Address Mrs. Henry Asmus, 7 Reservoir Ave., Ithaca, N. Y.

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is a water-soluble sulphur compound which evaporates, leaving the sulphur directly on the surface where wanted. It is miscible in many oils. Uniformly satisfactory in the treatment of practically all forms of parasitic skin diseases where sulphur therapy is indicated, such as sarcoptic mange, itch, dry and moist eczema and the lesser forms of skin diseases. Contains no cresylic acid, coal tar or creolin; hence is safe for cats and other animals susceptible to such poisons. About 95% deodorized; generally leaves no objectionable odor on household pets. Guaranteed by SULPHUR PRODUCTS CO., Greensburg, Pa.

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WANTED: To hear from veterinarian seeking location. One experienced with valuable horses preferred. Fine opportunity for prosperous small animal hospital. Chicago suburb. Address No. 317, care of VETERINARY MEDICINE.

WANTED: By 1940 graduate, position as assistant in a small animal or predominately small animal practice. Prefer location in east or midwest, but would go elsewhere. Experienced. References. Address No. 313, care of VETERINARY MEDICINE.

FOR SALE: Part or whole interest in fine old established country practice in deep south. Only experienced large animal practitioners over 30 need apply. Address No. 314, care of VETERINARY MEDICINE.

POSITION WANTED as assistant to Veterinarian: Graduating 1941. Considerable experience in small and large animal practice. Competent. References. Address No. 312, care of VETERINARY MEDICINE.

WANTED: Experienced veterinarian for small animal practice. California license. State qualifications and send photo in first letter. Address El Cerrito Veterinary Hospital, Inc., Rt. 2, Box 631, San Diego, Calif.

POSITION WANTED by ranking Cornell graduate, class of 1937, experienced in small animal practice. Will consider salary or attractive share arrangement. Give details. Address No. 316, care of VETERINARY MEDICINE.

WANTED: Graduate Veterinarian as assistant in small animal hospital in large Ohio city. Give full particulars. Address No. 315, care of VETERINARY MEDICINE.

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ernors. He was the first to bring to official attention the 1924 outbreak of foot-and-mouth disease, making its prompt control possible.

Carl Graff, 63, Bisbee, N. D., Royal Veterinary & Agricultural College of Denmark '06, in B. A. I. service, December 7.

Erwin Rudolph Steinman, 58, Taylor, Tex., December 20.

P. H. Burnett, Los Angeles, Calif., Kansas City Veterinary College '08, December 21.

E. G. Smart, 66, Napa, Calif., San Francisco Veterinary College '10, January, 1941.

G. D. Anderson, 47, Torrington, Wyo., Kansas City Veterinary College '17, practiced at Torrington 23 years, December 28.

Seymour V. Lewis, 65, Glenwood City, Wis., Grand Rapids Veterinary College '04, January 3.

O. Emmitt, 59, Wichita, Kans., Kansas City Veterinary College '06, January 10.

Simon D. Brimhall, 77, University of Pennsylvania, staff member of the Institute of Experimental Medicine of the Mayo Foundation for seven years, retiring in 1922, January 10.

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Clare Connell, Ontario Veterinary College, January 27.

L. C. Joiner, Fayette, Ala., January 28.

Wayne P. Robertson, 53, Buncombe, Ill., Chicago Veterinary College '16, served as 2nd Lieutenant in the Veterinary Corps during World War I, practiced in Buncombe for 25 years, January 30.

Andrew V. Derr, 80, Wayne County, Ohio, February 1.

Edward Coggins, Blooming Prairie, Minn., February 6.

Frank M. McConnell, 53, Litchfield, Mich., Grand Rapids Veterinary College '15, commissioned in the Army Veterinary Corps in 1918 and honorably discharged in 1919, practiced in Litchfield for 21 years, president of the Michigan State Veterinary Medical Association 1939-40, February 7.

Charles Burton Wright, 67, Morley, Mich., practiced at Morley for 30 years, February 11.

Dea McDonald, 66, Kendallville, Ind., Indiana Veterinary College '11, practiced at Wolcottville, Ind., and Rock Rapids, Ia., until moving to Kendallville in 1920, February 13.

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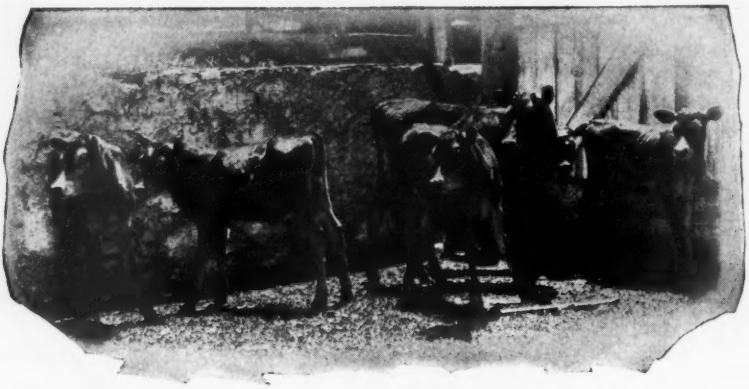

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